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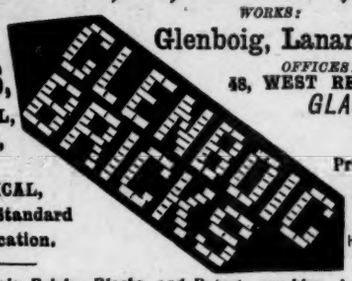

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EDITORIAL NOTES.

Changes at Horseferry Road.

THE loss of Sir Corbet Woodall means much to the Gas Light and Coke Company; for he was the very soul and centre of that reformation of internal policy and administration which was needed to rescue the great undertaking from conditions that would certainly have landed it in disaster if there had been perpetuation of them. But the severity of the loss made it all the more necessary that the best possible reorganization of the Court of Directors should be effected, in order that there should be an assurance of the maintenance of the progressive policy. The Board have raised Mr. John Miles to the Governorship, and Mr. H. J. Waterlow to the Deputy Governorship. We congratulate both these gentlemen upon the distinctions thus conferred, and from which distinctions they will admit there is no detraction when we say that the correct step, and the step anticipated in the gas industry, has been taken by them and their colleagues in having elected to the vacancy on the Board Mr. D. Milne Watson, the General Manager, who will henceforth take the title of Managing-Director, and thus give the Board a member who will be in daily contact with the affairs and the general working of the concern. Through some twenty years' experience of the Company's movements, developments, and transactions, and his personal qualifications, Mr. Milne Watson is eminently fitted for the dual position which he now holds. Observation permits the statement (he must forgive this personal remark) that he is not only a strong man, with a good grasp of the Company's affairs, but he has the confidence of officers and men alike. He is a man of initiative; and he is all for progress, and the adaptation of policy to fresh circumstances as they succeed one another. In his new position, he will have larger scope, and will be able to render even greater services than he has already done, not only to the Gas Light and Coke Company, but to the industry at large. Upon his new appointment, we congratulate him, and trust that he will for long enjoy the honour attaching to it—and perhaps in due time that attaching to still higher positions—and that the results for the undertaking and all concerned will be of the best possible in the controlling circumstances. All that devoted and unremitting duty can achieve will, we are certain, be achieved at the hands of the new Managing-Director.

The Oil-Washing Movement.

INTO the movement for assisting the Ministry of Munitions to secure from gas-works larger supplies of benzol and toluol, Mr. Thomas Glover, supported by the Directors of the British Gaslight Company, has thrown himself heart and soul; and, while that is the immediate necessity and object in view, he is, at the same time, looking ahead, for he sees commercial prospects of a no mean character in superseding by an oil-washing process the tar-washing of gas, which was never intended to be regarded as anything more than a readily applied expedient with a low and variable recovery efficiency, and subject to certain drawbacks, which demand constant care and supervision in order to avoid them, or diminish their effects. Further, he looks to works of even comparatively small gas output (Mr. P. D. Walmsley, of Wombwell, had some interesting information to impart in this connection) adopting oil-washing as an ordinary everyday process, now and hereafter, and so developing the secondary side of their business to the advantage of the primary side. The war has unquestionably put the gas industry on the high road to an exceedingly important development.

In order to stimulate the application of oil-washing (the result of his action is promising), Mr. Glover invited a number of gas engineers to visit Norwich last Thursday, to see what is being done there in the matter, and investigate both operations and results. On the occasion, the needs of the country and her Allies were accentuated by the presence and words of Mr. F. L. Halford and Mr. W. Doig Gibb, of the Explosives Supplies Department of the Ministry of Munitions. The process and the results achieved at Norwich were described in an article by Mr. Glover which appeared in our columns last week (p. 387). In the table headed "Comparison," there are striking figures, which show what the country and her Allies are losing, hour by hour and day by day, and ton by ton of coal carbonized, by gas not being subjected to washing by oil instead of by tar. The table presents the fact that, with the coal used at Norwich, it is possible to get out of the gas with oil washing 3·65 lbs. of toluol and 10 lbs. of benzol; but with tar-washing the amount of toluol is only 0·75 lb., and of benzol 1¼ lbs. The considerable differences suggest that, if the oil-washing process had only been adopted earlier, the strength of the Allied forces in explosives would have been irresistible, providing the production of shells, bombs, and guns had proceeded at a like rate. Efficiency in every line of work in this connection tells; and it is efficiency in the production of benzol and toluol for which appeal is now being made to gas-works. Mr. Glover has a way with him that makes the word "efficiency" swell with importance. "The Ger-" mans," he said in one of his speeches on Thursday [see report in other columns], "would be beaten by more effici-" ency, by thoroughness, and by scientific and technical " ability." If gas undertakings can do anything to help to shorten the war, and to reduce the sacrifice of life and property in this righteous cause, it is the duty and responsibility of those who control them to do it.

Naturally, the oil-washing process has an effect upon the illuminating power of the gas; upon the calorific power, the effect is negligible. It has a beneficial influence upon naphthalene and sulphur compounds. But regarding illuminating power, Mr. J. W. Auchterlonie made the point last Thursday that it would be of considerable help to gas undertakings in adopting the oil-washing process if they could be relieved of their obligations as to candle power. Perhaps we are nearer to a suspension of these obligations—at any rate during the war—than some people imagine; and there may be interesting developments almost immediately.

Toluol and the Limestone Process.

IT is pretty certain that the discussion which took place at the meeting of the Midland Association last Thursday will not do much to hasten or increase the application of the limestone process for the production in gas and ultimately in the gas-washing medium—whether it be oil or tar—of additional quantities of toluol and benzol. The gas profession is faced with a singular position in regard to experiences in this direction. At Long Eaton, every possible advantage that could accrue from the process has been obtained, as certified not only by Mr. George Stevenson, the Gas Engineer and Manager, but by the independent tests of Professor P. F. Frankland; while at all other works where the process has been applied, the engineers succeed one another in a gloomy tale of failure, under their individual conditions, in all but the reduction of sulphur compounds. Not only is failure recorded, but actual disadvantages in regard to stopped pipes and quality of coke are alleged—particularly in the matters of the increase of the ash content of the coke, the additional trouble occasioned in clinkering and keeping clean the furnace-bars, and in deterioration of heats. Long Eaton counters every line of adverse experience elsewhere, excepting in the matter of ash in the coke, which, it is conceded, is augmented by some 2 per cent. Mr. Stevenson is quite frank about the position. So long as he can increase the toluol and benzol in his gas, and secure collateral benefits, he is going to continue the process; but he does not recommend anyone else to adopt it, though they are quite at liberty to examine into

the results of his own operations, and draw from them their own conclusions. There is room for investigation here as to the causes of the differences in experience.

From the course taken by the discussion, it appears that the secret of diverse experience lies in the conditions. The results at Long Eaton suggest that the conditions there are all right, while the results at other works suggest that at them they are either all wrong or the most critical ones are. There is no question that, marshalling the conditions under which success with the process may be hoped for, it suffers considerably from severe limitations. It is no use for hand-charged retorts, for light charges, or for short-period carbonization. With it, mass and time are important factors; and so heavy charges and twelve-hour carbonization are found to be essential for the retort actions and reactions, whatever they are—whether arising from catalysis or other cause—which produce the beneficial result. Time must anyway be given to secure the decomposition of the limestone in the mass. The coal, too, must be small, in order to get thorough admixture of the powdered limestone; otherwise there is no use in making the application. Then the limestone must be absolutely pure, and finely powdered. The process, too, is only suitable for low-grade coals. From this statement as to salient and essential conditions, it will be remarked that the process is confessedly sensitive as to the conditions of application. This brings us back again to the question, Why do all the necessary conditions exist in combination at Long Eaton, and not elsewhere; or why does the process favour Long Eaton and not (say) Derby or Burton-on-Trent? Mr. Stevenson is evidently as perplexed as are other engineers as to the proper answer to be made to these questions. While it is the duty of, and a responsibility on, gas engineers to increase the output of toluol and benzol to the utmost extent, the means of doing so must be reasonable, and not bring any considerable disadvantage in their train, for there are some advantages that are gained only by paying too heavy a price.

Silica and Fire-Clay Materials.

Cordial welcome was given to Mr. John West, at the meeting of the Manchester Institution of Gas Engineers last Saturday, when he submitted a paper reciting experiences from his early professional days to the present with the refractory materials used in retort-settings. Veteran though he is in gas-engineering matters, there is always a freshness about what he has to say on any subject; and his buoyant spirits and confidence almost run one into the danger of thinking that the last word has been said that need be said on this subject of refractory materials, and that good fortune, experience, experiment, practice, and business acumen, have placed in his possession a refractory material which it would be difficult to beat for the purposes of retort-settings, and the temperatures at which they are nowadays run. Working results bear witness to the excellencies of this particular material, and to the soundness of the principles which govern its working up, and which principles are largely due to Mr. West's experience and assiduity in investigating constituents, and the right proportions to produce the highest efficiency in refractoriness under actual working conditions. There may be in the statements in the paper points for expert criticism; but working experience is a persuasive factor. While, however, Mr. West has attained to a high standard heat-resisting silica material, giving a minimum of contraction and expansion, he does not say that his is the only "pebble on the beach;" but he does submit that independent experience has declared that there are British refractory goods that have stood the test of time and temperature in manner far exceeding the best that once much-lauded German productions can do.

Notwithstanding the excellent experience with certain silicious refractory materials, Mr. West does not by any means contend that we have reached the possible summit of knowledge and of requirement in the essential qualities of these materials. He himself knows better than that; and he is an ardent supporter of all research work that has for its object the furtherance of information in regard to this important matter. Were he otherwise, he would stand in isolation; for, in the efforts that are being made to-day in the matter of industrial development in this country, one of the recognized primary needs is the provision of refractory materials that will resist the higher attainable temperatures so far as there is utility in them. Moreover, even at the applied temperatures of to-day, and with the best of materials, there is no certainty that there are not further improvements to be effected in composition and otherwise which will promote durability under temperature and load conditions, and improve heat conductivity where that (as in the case of gas-retorts) is a consideration, which it is not under all circumstances. If there was assurance that the conditions to the best results, under varied circumstances, were all known and could be specified, there would be no need for the further work of the Institution Refractory Materials Committee, nor of that of the experts who are engaged upon similar work elsewhere. Nor would there have been the need for the Committee of the Privy Council for Scientific and Industrial Research to have given the subject of refractory materials a place among the primary investigations which they consider it desirable to at once take up. There would also have been more hopefulness on the part of those interested in (say) surface combustion regarding the prospect of realizing materials that would enlarge the horizon of the usefulness of the system, by enabling working at higher temperatures. The manufacturers of gas-fires, too, would have had greater confidence in soon being placed in a more agreeable position in regard to the certain stability of "radiants" under the varying temperature conditions to which they are exposed. To a very considerable extent gas-fire radiants are constructed on purely empirical methods, and science must in this matter come to the aid of the gas-fire makers.

It is passing strange that, although retort-settings, especially since gaseous firing came into vogue, are the most vulnerable parts of gas-works plant, it is the part that has suffered most neglect in respect of investigation with the view to improving their resistance to the severe destructive influences that rule. Even when the subject has been studied scientifically, resulting specifications, as proposed by the Refractory Materials Committee, have been issued as more or less tentative, as it was impossible to say that they were finished in all respects. Suffice it to say that they have not escaped the critic. But, on the other hand, they are at present the best available specifications; and Mr. West urges that they should be observed as standard ones until something better is produced, and that there should be care that anyone who is employed by users to make scientific tests of materials should be compelled to likewise adhere to them and the tests in order that uniformity may prevail. But we are afraid there are still many invitations issued for tenders for refractory materials that are altogether devoid of any specification as to quality. The difficulty is for every gas-works in every place to readily have tests made of delivered material, to ascertain whether specifications have been complied with. This tendering for refractory materials without any specification Mr. West years ago set his face against; and he has remained satisfied that he was right. No one would hold otherwise. But the lines of the official Mr. West were cast in pleasant places, and where the making of tests of refractory materials was not a matter of difficulty. In former days, what did he find? That the practice of inviting tenders for refractory materials without specification was conducive to inferior and low-priced material being tendered for; and it certainly did not give encouragement to good firms to manufacture the best possible material. But we do not think that British makers of refractory materials are likely to go back again to past practices in this particular respect. Let it not be thought that we are advocating non-specification in connection with tenders. What we are attempting to do is merely to look facts in the face. Doing so, the definite conclusion is formed that there is no class of work in which inferior materials would have a greater detrimental effect upon the business of makers than in connection with the goods required for retort-settings; for the effects of using bad materials are so painful for the responsible engineer that a delivery of such material would make him solemnly vow that he would never patronize the same maker again. It was not many years ago that British makers of refractory goods began to see visions of German supremacy; and they do not (when the long-looked-for days of peace are here) desire a return of those visions, now that matters, largely through the work of the Refractory Materials Committee, have got upon a better footing.

The paper contains a considerable amount of practical and valuable information regarding silica goods, and it is bound to be all largely and widely read; for no gas engineer can afford to neglect any information which will assist him in improving the stability and the durability of his retort-

settings. Every possible economy must be brought to the credit of working to-day; and cheap refractory materials are not an economy.

Tar Products—The Industry's Opportunity.

SINCE the war started, the tide of self-abasement has been running high in this country; and people have been rather too frequently speaking as though our whole country deserved condemnation and censure for its gross neglect of all forms of enterprise in the past. Of course, our pre-war Board of Trade returns are an absolute answer to that. There could not have been a general lack of all those things and doings that subscribe and are necessary to prosperity, or there would not be such tangible facts to the credit of the country. We have only for further negation to look to the progress of the gas industry and the simultaneous advancement of the electrical industry. Such developments in two industries, the one competing against the other, could not have obtained had there not been development in the general industry and trade of the country, to afford them the ground upon which to work. The gas industry especially has to thank its good fortune that outside fertility has given it such grand opportunities for the promotion of its own interests; for truth to tell the gas industry's internal development has been largely produced by haphazard methods and by individual interest and labour, and not, until recent years, by any systematic scientific research with definite objects in view. However, in respect of the larger subject, it is necessary to descend from the general to the particular before finding cause for condemnation and censure. And when we do so descend, there is found another prominent and just cause for censure which also comes closely home to our own industry.

The truth has been put before the British chemical and tar-producing industries with almost nauseating frequency that it is due to their lack of enterprise that the Germans have derived such a golden harvest from aniline dyes, drugs, chemical compounds, and so forth, of which coal tar is the crude base. We know all that well enough; but Mr. J. Herbert Canning, in the paper that he read before the Wales and Monmouthshire District Institution last Wednesday, reminded us of it again, and with definite purpose. The war has taught us that this country and her Dominions must never again allow themselves to be (as they were at the start of the war) largely dependent for certain necessaries upon countries which, as in the present case, may become enemy ones. Had it not been that coal is the important national product of this country, that there were large carbonizing plants in operation, and that means were readily available for extracting high explosives from gas, the foresight of the Germans in providing and accumulating large stocks of these high explosives would have brought the war to a very speedy termination to our national cost and humiliation. Had it not been, too, for the same large reserves of power, the financial position of the country would have been considerably weakened through inability to obtain the dyes and colours immediately necessary for keeping many large industries afloat and productive. Other things might easily be cited, and are cited in the paper by Mr. Canning, in order to show directions in which there has been foresight upon the part of the Germans, and the contrary on our own part. The war, it is true, has proved our power of adaptability; but any credit for this is tempered by the knowledge that all we can immediately do leaves us far in the rear of the position in these particular matters to which our Teutonic enemies had attained while we were still slumbering. The greatest lesson of all in this connection is that the country must be made as far as possible self-contained in matters of liquid fuel, raw materials for explosives, dyes and colours, drugs and chemicals of all kinds; and the principal sources of all these are the gas and bye-product coke-oven industries. This is a consideration of far-reaching importance to our industry.

Admitting the errors of laxity and want of enterprise that have placed this country so much at the mercy of our enemies, the first step to permanent reformation and to the attainment of the goal desired, of making the country self-reliant and self-contained, is to investigate the causes of our inferior position in these respects. This is what Mr. Canning does in his paper; and he sets out the causes in a manner which shows them as fairly well distributed. The Government on the one hand are blamed; and after the violent but beneficial shocks they have had, it is hardly likely (Mr. Canning thinks) that they will allow our strength in the matters particularly in mind to be again similarly paralyzed. We hope this is true; if true, it will be an excellent thing for the country. But we must not rely too confidently upon the Government; there must be other forces at work outside. The Government have not since the war started evinced in substantial manner their appreciation that reformation in these respects and a much higher tide of prosperity are things worth purchasing at a big price. Several Committees have been appointed by the Government to do this and to do that; but the financing of the work of research and technical education does not support the idea that the Government have fairly proportioned their encouragement and benison to the possible yield of advantage. The Government and our manufacturers must realize that the successes of Germany in the past are the incentives along the same lines to greater efforts in future, and that she will pursue these efforts, in the words of Mr. Canning, restlessly and unceasingly. Then manufacturers in the directions in which we are the inferiors of Germany are not to be absolved from blame. They, too, have not given encouragement in the right quarters, and have been so dense as not to recognize the imperative need of doing so if they do not want the German trade octopus to squeeze the very life blood out of them.

The question arises as to why the manufacturers have not availed themselves of the scientific methods of ensuring industrial progress and trade; and the only answer that can be found is that they themselves, generally speaking, have not had sufficient scientific education to enable them to appreciate the value of it and of scientific research. This is at the root of the evil of the passive policy; and, this being so, it would be well if the remedy were applied by revising the curricula of the country's educational establishments, and incorporating in them sufficient scientific instruction to have an effect opposite to that which has resulted from the neglect. The same omission has tended to limit the supply of students in scientific matters, and hence the supply of men for technical research work. Separation from elementary scientific studies does nothing to energize and develop latent ability in these directions; and the country is the poorer. This being so, we have no patience with those short-sighted folk who think that the introduction of scientific studies into the general educational plan would injure the literary studies. The one is the supplement of the other; and those without a decent ordinary education will not have the intellectual capacity to absorb much in the way of science, so that from natural causes the opposing argument falls to the ground. Then greater system is required in our scientific and technical education; and above all manufacturers need to be educated up to the making of a proper assessment of the value of trained scientific investigators and controllers of operations. In this we have another effect of the want of incorporation of scientific instruction in the schools, and another cause why more men have failed to be attracted to scientific work in association with industry. Brains—particularly those that have been developed by application and by the expenditure of time and money—must be paid for, and liberally. Another matter which requires remedying is the British patent law, which, as Mr. Canning says, has been used by the Germans for the erection of "barbed wire "entanglements" against the British.

So by research the causes of past apathy are traced, and so, too, the reasons why Germany has advanced, with rich reward, into territory only the borders of which have been touched by us. Having found these causes, it is the duty of the country to set about eliminating them. If this is done, there is new wealth awaiting; if it is not done, we must continue to find ourselves retreating in various industries before the scientific education and the applied science of Germany. It does not require any great exertion to see, as Mr. Canning puts it, how supremely important it is that the gas industry, which is so vitally interested in certain branches of manufacture, at the base of which tar is an essential, should take action (if desirable in combination with other interests) to urge upon the nation the necessity of clearing away old obstacles, and providing new facilities, in order that we may once more come by our own. It was not long since that Mr. Thomas Canning raised this very point in our "Correspondence" columns, in relation to the gas industry's interest in the dye scheme. But what has happened from the side of the gas industry? So far as we are aware —— Nothing at all. The "Do-Nothings" are potential enemies of progress.

Extravagancies.

The "Engineering Correspondent" of the "Daily Telegraph" has been indulging in what we regard as certain extravagancies concerning economies that are to be effected in artificial lighting by the daylight saving system. This summer it will have 133 hours to its credit in the form of utilized daylight, but it is problematical whether 133 hours of artificial lighting will be saved in consequence. The writer sets off by asserting that, in the aggregate, there will be an "immense" saving in artificial illumination; for not only will thousands of factories be affected, but innumerable domestic, industrial, and other establishments, "*each* saving its *few units* of electricity or '*thousands*' of gas per night." If a "few" units represent "five," this would mean with metallic filament lamps (say) 4000 candle-hours. If "thousands" of gas also represent five, this would mean, with low-pressure inverted lamps, 100,000 candle-hours! The "Engineering Correspondent" is speaking of one night. We do not know whether this is intended as a compliment to gas, or to denote extraordinarily luxurious lighting by it, or a terrible waste. Anyway, we do not happen to know (say) a domestic establishment that will save "thousands" of cubic feet of gas per night through going to bed an hour earlier; but we should say, if such a household exists, it would pay it to retire to bed even earlier still. Anyway, we read that "this will mean millions of tons of coal saved by the gas and electricity works of the country. . . We shall certainly gain financially by the change, nationally and individually."

Doubtful Realization.

We are happy to hear it. But how are these "millions" of tons of coal going to be gained by economy of artificial lighting, even assuming the saving extends to 133 hours in summer? In the gas industry about 17 million tons of coal are used in normal times, excluding oil. Oil is difficult to obtain now, and the price prohibitive. Notwithstanding lighting restrictions, early shop closing, and shorter hours' opening of licensed premises, the gas industry—through the condition of the oil market, and the extra demands made for gas for munition work—will probably still want all that 17 million tons. Seeing, too, that about 50 per cent. of the annual gas make of the country is sent out during the hours of daylight, and have therefore nothing to do with illumination (the requirement for which is at the minimum during the summer months), we fail to see how "millions" of tons of coal are to be saved by the industry; and the central electric stations of the United Kingdom are much smaller users of coal than the gas industry. Then we further read that "throughout the day great gas-engines and annealing ovens are using up millions of cubic feet of gas;" and "it is demands of this kind that provide the explosives works with the bulk of the material they require." Great gas-engines and annealing furnaces are not distributed all over the United Kingdom; but the washing of gas for the extraction of benzol and toluol is so distributed. It is a pity our friend is not better informed on these subjects—particularly on the one as to the coal economies likely to be achieved by daylight saving spread over 133 hours in summer.

"Navvies in Skirts."

A representative of the "Evening News" has been interviewing an official of the Board of Trade Employment Bureau regarding the displacing by women of men of military age and fitness; and he gives the results under the above unfair title. Of men of military age and fitness, it is stated, there are still 25,000 to 30,000 employed in gas and electricity works. We hope it will not be regarded as disrespectful if we say that we flatly decline to believe anything of the kind. The representative was also told that, in connection with a number of gas-works, women are now employed for inspecting, testing, and reading meters, and collecting accounts, while other undertakings are as yet utilizing no women. "One large gas company," it is said, "requiring about 12,000 men, report that they are employing 23 women to replace men as clerks, showroom attendants, and cleaners, messengers, stove-fitters, and in mantle maintenance." The 12,000 men suggests that the reference is to the Gas Light Company; and, if this is so, "23" falls very far short of the glory of the actual number of women and girls who are doing their "bit" for the country in connection with the operations of that Company. The Governor (the late Sir Corbet Woodall), at the meeting of the Company last February, stated that they had 420 women and girls in their employ. The report goes on to state that another company almost in the next street, employing nearly 7000 men, have "not substituted a single woman for a man." If the South Metropolitan Gas Company are referred to, that concern has also done quite a noble part in this way. The report adds: "In a certain number of cases, women are employed on heavier work, such as screening and loading coke. In Birmingham, nine women were placed by the Labour Exchange at the beginning of April as coke loaders at 25s. per week in the City Gas Department. If the experiment proves a success, the work is to be extended. Fifty women navvies have been taken on as labourers at the municipal gas-works in Coventry. Their work consists in filling barrows with coke, washing coke, and wheeling it up planks to the railway trucks. About half of these have been brought from the colliery districts by the Labour Exchange; and they received 24s. per week, and are housed free, 1s. 6d. per day being charged for board." When the members of the Eastern Counties Gas Managers' Association visited the Tottenham Light, Heat, and Power Company's works the other week, they saw women unloading and stacking bricks from railway trucks, who showed themselves quite adept at the work.

Alien Enemy Patents.

A case which was lately before the London Patents Court should be noted by manufacturers, who may in many instances be able usefully and profitably to avail themselves of the hint which it conveys. Since the outbreak of the war, the authorities have received approximately a couple of thousand original applications for patents from German and Austrian inventors, in connection with which they have not been issuing new patents. They have, instead, obtained and filed specifications from the foreign applicants; and then the matter has come to a stop. In no case has the patent been sealed. There are therefore on hand a large number of "unsealed patents," or specifications relating to applications for patents which have not been granted. These are it seems open to manufacturers to apply for under the special legislation dealing with the matter; and the first case has now come before the Patents Court, with the result that the Comptroller of Patents has intimated that he would recommend the issue of a licence, at 5 per cent. royalty on the selling price. The licence in this case (the procedure was, of course, new) would be executed by the Public Trustee, who would be custodian of the "unsealed patent." Somebody would have to pay the sealing fee, which would be deducted from the royalties.

Organization of Manufacturers.

Manufacturers prepared to pay a fee of £1000 may become preliminary members (the minimum number to be not less than a hundred) who will form the basis of the Grand Council of a central organization of manufacturing interests, an effort to establish which is being made, with the object of uniting and strengthening the industries of the United Kingdom. The idea of those who are taking steps to bring this about is to form one strong representative and influential body, which will include all the individual effort that is at present being made by separate organizations. At an informal meeting of interested persons, it has been decided that such an Association shall be formed; but until the minimum number of one hundred preliminary subscribers already alluded to is guaranteed, no step towards the establishment of the Association or the arrangement of detailed working conditions will be taken. The Hon. Secretary *pro tem.* is Mr. A. W. Tate, of Basildon House, Moorgate Street, E.C.; and those who think of taking part in the movement should note that their consent to join is only asked for conditionally on the minimum membership being obtained, and on the approval of individual subscribers to a policy to be determined at a meeting of members, which will also consider the terms on which existing Manufacturers' Associations and others shall be invited to join. Among the industries to be amalgamated in the scheme are iron, steel, coal, electrical undertakings, chemical product manufacturers, and engineering. So far as it is possible to indicate a programme, it is thought one of the first objects of the Association may be to press for a Ministry of Commerce. A friendly disposition towards labour organizations, too, is intended; the idea being to have one influential body representing industry, to whom Parliament can appeal on questions "which are likely to arise in this country in the near future as they have never arisen before." In short, it is

proposed to establish a sort of Industrial Parliament. There will be much work for such an Association to do.

Coal and Coke Exports.

Continuing our record of the monthly conditions prevailing in connection with coal and coke exports, it is observed that during April the quantity of coal sent abroad amounted to 2,960,730 tons, which is a reduction of 2,253,288 tons upon April, 1914; the exports that month having amounted to 5,214,018 tons. In April, 1915, the diminution upon April, 1914, was 1,444,254 tons; so that last month exhibited a further decline upon the corresponding month of last year of 809,034 tons. The quantity of coke exported in April, 1914, was 67,615 tons; in April, 1915, 70,523 tons; and in April, 1916, 111,134 tons.

PERSONAL.

Mr. T. E. WHITE, who for the past five-and-a-half years has been Manager at the Gillingham (Dorset) Gas-Works, has been appointed Manager of the Saltash (Cornwall) Gas Company. He is succeeded at Gillingham by Mr. COWLING, late of Honiton.

OBITUARY.

THE LATE SIR CORBET WOODALL.

An Appreciation by Professor Arthur Smithells.

THE death of Sir Corbet Woodall is sincerely mourned in the University of Leeds. He was second only to Sir George Livesey himself in supporting the enterprise for establishing a university department in the interests of the gas industry; and when at a later date it was proposed to endow the new chair as a memorial to Sir George Livesey, he gave the full weight of his influence to secure this object. He showed the liveliest interest in the work of the department; and it was his own wish that the "Corbet Woodall Scholarship" should be assigned to the University.

The University in its corporate capacity will, at the earliest opportunity, record its sense of the loss which has been sustained through the death of its honorary graduate and benefactor; but I hope I may be permitted to anticipate this by a few personal words. It was my good fortune to have much conference with Sir Corbet Woodall in relation to our aims and work in Leeds; and I cannot express too gratefully my sense of the value of his advice, or too warmly my respect for him as a man. With great business ability, wide experience of the world, profound knowledge of men and things, he combined a breadth of sympathy, refinement of courtesy, and sensitiveness of honour which made indeed a great personality. He belonged truly to the *noblesse* of our industrial world. Such men make themselves and their calling honoured everywhere, and their influence in the Councils of a University is of supreme value in the great and urgent cause of bringing science into just relationship with industry. I can say with all sincerity that Sir Corbet Woodall will be mourned as truly, and remembered as respectfully, among the men of science who had the privilege of knowing him as among the multitude of his immediate fellow-workers.

Among those who were present at the funeral of the late Sir Corbet Woodall last Saturday week, and whose names were by inadvertence not included in the list published in the "JOURNAL" for the 23rd inst., were Sir Hallewell Rogers, the Chairman of the Birmingham Gas Committee, and Captain R. S. Hilton, Secretary and Manager of the Gas Department; Mr. H. D. Ellis, a Director of the Commercial Gas Company; and Mr. C. W. Braine, the Secretary, who attended to represent the Wandsworth, Wimbledon, and Epsom District Gas Company.

Mr. ALEXANDER ROSS, the Manager of the Burntisland Gas-Works, died yesterday week, in his 78th year. He was a native of Invergordon, Inverness-shire.

Manchester District Institution of Gas Engineers.

The 175th quarterly meeting of the Institution was held at the Grand Hotel, Manchester, on Saturday, under the presidency of Mr. E. A. Harman, M.Inst.C.E., of Huddersfield. There was a large attendance of members and representatives of firms particularly interested in the subject to be brought forward for consideration—who were specially invited by the Committee to take part in the discussion. By some unfortunate accident, altogether inexplicable at the moment of going to press, our report of the proceedings is not to hand; so that for this week we are able to give only the paper read by Mr. John West, M.Inst.C.E., M.Inst.Mech.E., on "Silica and Fire-Clay Materials, with Practical Examples of their Expansion, Contraction, and Refractory Qualities"—deferring until the next issue a report of the discussion to which it gave rise. The paper will be found on p. 442.

THE GAS LIGHT AND COKE COMPANY'S COURT.

Mr. John Miles, the Deputy-Governor, has been appointed Governor of the Gas Light and Coke Company, in the place of the late Sir Corbet Woodall; and Mr. H. J. Waterlow has been elected Deputy-Governor. Mr. D. Milne Watson has been elected to the vacant seat at the Board, and has been appointed Managing-Director of the Company.

Mr. John Miles has had a wide experience in connection with the administration of gas and other large undertakings, as will be seen from the following record of his activities:

In 1856, he became a Governor of St. Bartholomew's Hospital.
In 1864, he became a Governor of Bridewell and Bethlehem Hospital.
In 1873, he was elected a Director of the old Brighton Gas Company; and
In 1882, as Chairman of that Company, he joined the Board of the Brighton and Hove Gas Company, with which Company an amalgamation took place.
In 1903, he was elected Chairman of the amalgamated Company, retiring from the Board in 1909.
In 1880, he was elected a Director of Mudie's Select Library, and was made Chairman in 1884.
In 1884, he was elected a Director of the West Middlesex Water Works Company; and
In 1896, he was elected as a representative of this Company on the Board of the Staines Reservoir.
In 1884, he was elected a Director of the West African Telegraph Company, retiring from the Board in 1889, on Sir John Pender obtaining a controlling interest in the shares of the Company.
In 1887, he was elected a Director of the New River Company, which, with the West Middlesex Water-Works and the Staines Reservoir undertaking, was purchased by the Metropolitan Water Board in 1905. He continued a Director of the New River Land Company.
In 1888, he became a Director of R. Clay and Sons, Limited (printers), and retired in 1890.
In 1891, he was elected a Director on the formation of Brickwood's Portsmouth Brewery into a limited liability company.
In 1891, he was elected a Director of the Southgate and District Gas Company (then called the Colney Hatch Gas Company). He was elected Chairman in 1904.
In 1893, he was made a Justice of the Peace for the County of Middlesex.
In 1896, he was elected a Director of the Hornsey Gas Company, and was appointed Chairman in 1906. Retired from the Board in 1911.
In 1896, he was elected a Director of the Lea Bridge District Gas Company, and was made Chairman in 1900. He retired from the Board in 1911.
In 1897, he was elected on the Court of the Stationers' Company, and became Master in 1902-3, taking the chair at the dinner given by the Company in celebration of their 500th anniversary.
In 1898, he was elected a Director of the Gas Light and Coke Company—becoming Deputy-Governor in 1912; and Governor in 1916.
In 1902, he was elected a Trustee for the debenture stock holders in Mann, Crossman, and Paulin.

Mr. Herbert J. Waterlow joined the Board of the Company in 1906. Mr. D. Milne Watson has been General Manager since 1903; and how thoroughly his work is appreciated, is shown by his new appointment. He was called to the Bar in 1896—having taken the degrees of M.A. and LL.B.—and a year later he accepted the post of Assistant General Manager of the Company, becoming General Manager on the retirement of the late Mr. J. W. Field.

Wright's Canteen Apparatus.

In an introduction to a fully-illustrated list of their extensive range of cooking and water-heating apparatus for canteen equipment, Messrs. John Wright and Co., of Birmingham, point out that the Director of Factory Construction in the Ministry of Munitions, in an official communication to managers of every munition factory in the country, strongly urges that, in face of the present need for an increased output of toluol and benzol, gas should be used, among other purposes, for the cooking of hot meals for employees and for the provision of hot water for baths and lavatories, and for washing purposes generally. As has been said, there is a large choice of apparatus provided; but those who are not quite sure of the precise extent of the provision it would be wise to make, may well be guided by the information given in Messrs. Wright's "selected equipments for munition works' canteens of graded sizes." The specifications are respectively for 50, 100, 200, 300, and 500 persons; and as evidence that they may fairly be relied upon to meet requirements, inquirers may be referred to the long list of munition works' canteens which have already been supplied with Wright's cooking and water-heating apparatus.

Yorkshire Junior Gas Association.—The next meeting of this Association will be held on Saturday at the Leeds Institute, when Mr. John Lee, of Hasland, will give an address entitled "Some Notes on Fuel Economy."

Manchester Coal Conference.—In view of the interest attaching to the report of this Conference which appeared in last week's issue (p. 403), it has been reprinted as a pamphlet, copies of which can be supplied on application to the "JOURNAL" office.

ELECTRICITY SUPPLY MEMORANDA.

MATTERS have so shaped themselves during the war that the "Engineering Review" does not see why, when peace is restored, the gas and electricity supply industries should not live in "love" and concord for ever; and it is also hoped by our contemporary that there will be an indefinite continuation of the collateral development that has taken place in the two industries due to the straining of every nerve to help in the war. Of course, we are sincerely grateful for the good wish; and perhaps we ought to be the same for the admonition that is found in the statement that "there is no need for the bitterness which has characterized the rivalry of electricity and gas during recent years." But about the pious wish as to peace that is another matter. Our contemporary finds there is an ample field of application for both forms of energy, and that central station engineers have as little ground to anticipate the early collapse of gas undertakings as the latter have to expect that the extraordinary growth of electricity supply will not be continued. We have long since been convinced as to the sufficiency of the field of business for both industries; but experience rather encourages the opinion that it is too much to expect that, under the conditions of business, the signs of rivalry will for ever vanish. The fact of the matter is that the electricity industry long ago dropped into the bad habit of telling falsehoods about gas among people whose custom it desired to filch from its competitors; and, when the latter industry told the truth about electricity, the people "at the shop over the way" did not like it, and characterized the statements as something that was very hurtful to the sensitive feelings of gas people. The selfish desire of wanting things all its own way has got such a hold upon the electricity industry, that it is feared it will not be in the present generation of electricity purveyors that the habit of employing any means to attain their end will be a thing of the past. We are sorry, for the sake of our kindly disposed contemporary, that the prospects are not more promising as to a cessation of trading hostilities after the war. It is a great pity, but the conditions—the two industries are fighting largely for the same custom—are against the peace and calm that the "Review" would like to witness.

Industrial Peace.

Amalgamation of the Two Industries.

Our contemporary is in favour of the amalgamation of the two industries; it finds that there are sound technical reasons for it. This has been talked of before. But the electricity supply industry refuses to be swallowed up by the gas industry; and the gas industry is much too big a thing—having so many ramifications through its primary and secondary products—for the electricity supply industry to absorb. It is in the economical utilization of fuel that the "Engineering Review" sees the source of the start for an amalgamation. In Germany, it finds, the value of the bye-products liberated by the carbonization of coal is widely appreciated; and it is thought that this country might take a lesson from Germany in this respect. What is there in Germany, in the way of bye-product recovery in coal carbonization, that is not already done by the British gas industry, and is now being done to greater extent than before the war? We have often told electrical engineers that they are unpardonable prodigals in their crude methods of coal utilization, whereby they destroy all the valuable constituents of coal that are in the thoughts of our peacefully minded friend, the "Engineering Review." But what cares the electricity supply industry? It goes on in its old ways, and seems likely to continue to do so, unless the Legislature steps in and prohibits the use of raw coal under steam-boilers. There is no reason why, without the amalgamation of the two industries, the electricity industry should not be compelled to adopt gas coke (with forced draught), or gas, instead of crude coal, for the heating of their steam-boilers. Talking of amalgamation and savings, for some years now gas undertakings have been generating electricity by the aid of gas-engines, or by steam generated in boilers under which coke breeze and dust are used. But the electricity people do not like them generating electricity for their own use in this way. Then some gas companies have obtained powers from Parliament to supply districts without an electricity service; and there has been the strongest resistance on the part of the electricity supply people to this piece of economic venture. The "Engineering Review" points to the modern progress in the uses of gas and electricity; but it makes a slip in dealing with the lighting of workshops. It says that, as regards lighting, "it can hardly be denied that electric lighting is more convenient and suitable for workshops of all kinds." Has our contemporary ever studied this matter in relation to the intrinsic brilliancy of the two illuminants, and the effect upon the eyesight of workmen? If not, it would be profitable to do so. And again it says that the electric light is particularly suitable for those places in which inflammable or explosive materials are used. Gas undertakings have employed electric light in places where there are inflammable gases; and fused wires, and wrecked buildings, and at one place loss of life, have rather unsettled their views on the subject. In coal mines, too, electric wires and inflammable gases have shown that their relations can sometimes be of an inimical character, and the results disastrous.

Furnace Investigation.

In America very persistent investigation is going on in order to attempt to eliminate the defects of the electric-furnace; and, apparently in this country, it is intended to devote considerable attention to the subject. There is indication of this in the address that Sir Robert Hadfield lately delivered to the Ferrous Metallurgy Section of the Standing Committee on Metallurgy appointed by the Advisory Council for Scientific and Industrial Research. He mentioned proposals made by the National Physical Laboratory for research in the metallurgy of steel and refractory materials, and alluded to the work done in Sheffield. So far as we have seen, Sir Robert did not anywhere mention the gas-furnace, despite its very extensive adoption. But perhaps he regards the gas-furnace as an established thing, and has a leaning towards giving the electrical weakling every possible chance by bringing to bear upon it the best of scientific research. We must not assume, however, that the gas-furnace was not in his mind, because, in making suggestions as to directions in which more light is required, he said they represented "a few among many subjects." The programme embraces: More accurate determinations of high temperatures, including the improvement of electrical and optical pyrometers; electric-furnaces; hardening methods, effecting further improvements and special baths; electrical qualities of various alloys of iron and steel, including improving their permeability; refractory materials, sands, fire-clays, and rendering ourselves independent of foreign sources. It would be well if the Institution of Gas Engineers will note (in the absence of the larger, representative organization that it is hoped the gas industry will possess some day) that Sir Robert suggests that the co-operation of the various scientific and technical bodies should be secured, and that the institutions should be invited to suggest subjects for research, and that they should consult one with the other so as to be in accord and thus avoid overlapping. Also that any institution which appoints a responsible Committee and undertakes to make a definite approved research should receive grants from time to time according to the certified costs incurred. Also, that there should be no restriction as to the laboratory or works where the research is to be carried on. Finally, that each institution should appoint its own research workers subject to approval by the Advisory Council. In commending this matter to the Institution of Gas Engineers (with which the Society of British Gas Industries may be linked), we have in mind what is said in the annual report of the former body as to having obtained a grant in respect of the research into refractory materials, but the grant does not strike us as a substantial one for such an important piece of investigation. In these days, perhaps, we have to be thankful for small mercies. At the same time, although the gas industry has such a tremendous lead in connection with gas-furnaces, it must not overlook the growing vigour of research in the matter of electric-furnaces, with a view to obtaining for them a better footing.

Meter Errors and Fluctuating Auxiliary Demand.

In a recent article the "Electrical Review" discusses the question of meter errors in the case of a factory having a private generating plant and purchasing auxiliary energy from the town supplies. During the period when the purchased current is being used to supplement the home production, the two supply sources are connected in parallel, either electrically by linking-up the public and private mains to a common bus-bar, or mechanically by using (say) the private steam-engine and an electric motor supplied from the public mains to drive a transmission system which is mechanically continuous. As a rule, the supplementary supply would be sold by meter on a sliding-scale; and our contemporary remarks that "it is important to note that the readings of a meter used under such circumstances are liable to be anything up to 100 per cent. slow, due to reverse running during low load when the load curve is very fluctuating." This is an uncomfortable state of things, and is another reflection on the efficiency and truthfulness of the electric-meter. It adds that, on a steady, or reasonably steady, load, the trouble does not arise. But if a rapidly fluctuating load is concerned (as in textile mills, particularly spinning mills) the private power plant runs at full output continuously; the central station supply is drawn upon during the peaks of the load curve, and more or less of this amount of energy is returned during the troughs of the load curve. In the concluding part of the article, the "Electrical Review" points out that one way of obviating error due to reversal in the above manner is to provide the meter with some form of locking gear which prevents the armature making more than one backward revolution. But, even so, it is possible to lose a great deal of revenue in the course of a year where the load fluctuates so rapidly. The best method of overcoming the difficulty named is to provide such fly-wheel inertia in the plant to be driven that the peak demand from the mains is reduced, and the private generating equipment is kept busy on the load itself, or in bringing the fly-wheels up to speed. The circuit conditions are equalized without troublesome equalizing currents flowing.

Mr. R. S. Gardiner has been elected Chairman of the Danish Gas Company, in the place of the late Sir Corbet Woodall. Mr. Gardiner has, of course, had considerable experience in connection with gas company administration, both at home and abroad.

THE NORWICH OIL-WASHING PLANT.

WITH the view of demonstrating the advantages of washing gas with oil, in order to extract the toluol and benzol, and the urgent desirability on national grounds for all gas managers to adopt this process forthwith, instead of washing with tar, the Directors of the British Gaslight Company entertained a party of about forty gas managers in the Eastern Counties, and a few beyond, to lunch at the Maid's Head Hotel, Norwich, last Thursday.

The function was severely businesslike; the simple luncheon being followed by an interesting description by Mr. Thomas Glover of the plant at the Bishop's Bridge Gas-Works, described in last week's "JOURNAL." There was, in addition, an equally interesting account by Mr. Walmsley, of Wombwell, of a similar plant designed by the Wombwell Engineering Company, with certain modifications to adapt it to a much smaller gas-works than those at Norwich. The gathering really partook of the nature of a District Association meeting; the working of the two processes being elucidated by the aid of large-scale drawings. Among the guests were Mr. F. L. Halford and Mr. W. Doig Gibb, as representing the Ministry of Munitions, both of whom contributed to the speeches. The party subsequently had the opportunity of visiting the works and seeing Mr. Glover's plant in operation—incidentally picking up more information on a matter which is certainly destined to play an important part not only during the war, but afterwards. Mr. Glover's enthusiasm and forceful manner undoubtedly left its mark on his guests, not a few of whom had made up their minds before leaving Norwich to go in for oil-washing, for the facts brought forward demonstrated beyond question that the results of the working of the process have a commercial as well as a national aspect. In other words, the adoption of oil-washing must be regarded not as a war-time expedient, but as a development in gas-works practice which the exigencies of the war has brought about, but which will remain as a permanent improvement.

THE LATE SIR CORBET WOODALL.

Mr. THOMAS GLOVER (after luncheon) said they met together under a cloud; for the Chairman of the British Gaslight Company, and the Governor of the Gas Light and Coke Company as well as of the Tottenham Light, Heat, and Power Company, had just passed away in the person of Sir Corbet Woodall. Sir Corbet took very great interest in the matter they had met together to consider. It was through his influence, and his support and help, that the plant had been erected and got to work at Norwich; and had he lived, Sir Corbet would have taken a great interest in the meeting that day, and would have lent his powerful influence towards the spread of the movement for the greater production of benzol and toluol. It was through his influence that the Gas Light and Coke Company's chemical engineering staff designed the first plant put up for the Company; and it was due to him (Mr. Glover) visiting the plant, and seeing what was being done there, that he was able to arrange for the smaller plant now working at Norwich to be designed. This plant was the first of its type; but there were one or two similar ones going up in different parts. By the death of Sir Corbet Woodall, they had all lost a friend. He had a gracious personality; he was pre-eminently a friend to those with whom he came into contact; and he would be missed in their circles very much indeed. He wished to pay this little tribute to Sir Corbet's memory; and he felt sure they would all sympathize with the words he had expressed.

THE NORWICH PLANT.

Mr. GLOVER (continuing) mentioned that a number of well-known people had written regretting their inability to be present; but he was nevertheless extremely pleased that there was such a very representative gathering of the district which came under his supervision. Indeed, there were present one or two gentlemen who were outside the district. Dealing with the matter in hand, he said that the results from tar-washing had been good in places; indifferent in some others; and absolutely bad in others. And there were various reasons for it. Tar was a material that varied in nearly every works; and while in some it was very suitable for the extraction of toluol and benzol, in others it was very unsuitable. This was where the advantage of oil-washing came in. It was an absolutely certain process which could be depended upon and adjusted as much as one pleased. It could be made to do anything they pleased, and thus obtain the results so much desired by the Ministry of Munitions. He would not for the moment say anything on this point, as he was going to ask Mr. Halford to speak on the subject of a paragraph which appeared in the reprint of the article which he had written for the "JOURNAL OF GAS LIGHTING" in preparation for the meeting, and copies of which he would hand round. The paragraph in question was the last one, which read as follows:

> But apart from any question of revenue or profit, the demand of the State on our resources ought to be sufficient. If the authorities responsible for the provision of raw material for the manufacture of high explosives make it clear that benzol and toluol must be provided in larger quantities from gas-works, no time should be lost or effort spared in supplying the demand.

He hoped they would all agree with this sentence, and would brace themselves up for the effort; for an effort was required. But first of all it was the duty of the authorities to make the point clear as to what is wanted. Mr. Halford had been good enough to come down from town, with Mr. Gibb as his technical adviser, and he would try to speak on this point. Therefore, before going further, he would ask Mr. Halford to give them the views of the Ministry of Munitions.

Mr. HALFORD remarked that the very pleasant circumstances of the gathering must not let them forget that the country is at war, and that the primary object of the meeting was to consider what further could be done in developing and utilizing the resources of the country in providing the maximum quantity of benzol and toluol. As Mr. Glover had suggested, the tar-washing process was excellent as a start; but events moved very quickly in war time; and the tar process which was introduced only about a year ago was already becoming old-fashioned and out-of-date. And small wonder. The winning of the war must be, and he believed it was, everybody's first consideration; and it was a consideration which overruled all others. This being the case, we might just as well only utilize our national resources to the extent of producing half the possible quantity of guns as not to produce the maximum possible quantity of raw material—such as benzol and toluol. He did not think his remarks would influence them anything like as much as an inspection of Mr. Glover's plant; and when they saw the steady trickle of benzol, and thought of what would be the position of the French, and incidentally ourselves, if they ever ran short of shells in the defence of Verdun, and when it was remembered that the French rely mainly on the benzol we sent over to fill their shells, it would be a great disappointment if many of those present did not leave Norwich that day with a fixed determination to wash their gas with oil with a similar apparatus to that of Mr. Glover, and with a determination to strip the utmost possible quantity of crude benzol and toluol from their gas. Apart from national considerations, he had a very firm conviction that these plants had come to stay at gas-works; and where they were erected, he had little hesitation in saying that they would be operated for many years after the war. We all very naturally seemed to have a feeling of weariness of the war, and not only weariness—very many were being worn out by the war. But none the less on no account must we ever feel accustomed to the war. We must all feel that we are a vital part of it. There must be no relaxation. Everybody must pursue his part energetically and remorselessly to the bitter end; and so far as gas managers were concerned, they at least were fortunate in that their part was clearly defined. He thanked Mr. Glover for his hospitality, and very much appreciated his initiative in installing the plant. His advocating of the erection of similar plants in other directions, which was absolutely in accordance with national requirements, was even more deeply appreciated.

Mr. W. DOIG GIBB, called on by Mr. Glover, said he would really have preferred not to say anything, as the case had been put so clearly by Mr. Glover and Mr. Halford. But there was just one point Mr. Glover had reminded him he might speak about, and that was that tar-washing had become old-fashioned in this way. At first it was not realized that there would be such an enormous demand for benzol; and tar-washing was primarily started for toluol recovery. Now he thought he was right in saying that the benzol demand was really of greater importance—not that toluol was unimportant. But the greater demand at the moment was for benzol; and for this reason, if no other, the oil-washing process should be seriously considered in preference to tar-washing.

Mr. GLOVER, after thanking Mr. Halford and Mr. Gibb for their remarks, pointed out how happily placed they were in Norwich in having a Corporation with a Town Clerk, as its chief legal adviser, who treated the Gas Company in the very best way. The Company had not been interfered with at all in carrying out the wishes of the Ministry of Munitions; and there had been no friction and no questions asked. Norwich was doing its part thoroughly in conducting the war as it should be conducted. The war could not be conducted by sentimental expressions and feelings; it could only be done by great effort. It would take all our effort to the extremity to win this war as it ought to be won; and it was no time for taking things lightly, or leaving it for someone else to do. It was for everyone to do his part; and those who were not taking it in this light would be ashamed of themselves afterwards. He welcomed the presence of the Town Clerk and the City Engineer, who, by the way, was a thorough believer in tarred roads. Mr. Glover then described the process, by the aid of the article in the "JOURNAL" last week and a drawing. After mentioning the advantage of steam-heated stills, as allowing of greater regulation of the temperature, he made an interesting point as to the scrubber. This was first of all erected in the year 1875 at one of the works of the Company. The works were dismantled in 1904; and the scrubber was then re-erected as a water-gas scrubber. It, however, was not found necessary; and it was pulled down again; and he never thought it would be wanted further. But it had now been re-erected again, and did not make a bad job. At the present moment the plant was making 400 gallons of spirit, containing 40 per cent. of benzol, per twenty-four hours. There was something definite about the process. The spirit could be seen, and the quantity going into the storage tanks was known; and whether it was being sold as crude spirit or whether it was sent to the rectification works—his spirit was sent to the British Gaslight Company's rectification works at Yarmouth—there was something definite. With tar, it was a different matter. More or less varying quantities of toluol were absorbed in the tar; and there was very little benzol. The tar distiller said it cost him more to test it than it was worth to him, and so he would pay nothing

more for the tar. He also usually said the price of pitch had gone down, and the price of creosote was very bad, and generally nothing could be got for what was absorbed in the tar. Therefore he (Mr. Glover) recommended oil-washing for its definite results; and these results were very different from those obtained with tar, as the figures in the "JOURNAL" article showed. It was a pity the oil-washing process was not introduced earlier. It ought to have been. It was possible with oil-washing to get nearly 4 lbs. of toluol out of the gas and 10 lbs. of benzol per ton of coal carbonized. But with tar-washing, the toluol was only ¾ lb., and the benzol was only 1½ lbs. Thus there was a tremendous difference between the two processes. He was speaking of tar-washing at its best. He could tell of some experiences with tar-washing which were very different even from these figures. He could tell of a tar which was not at all fit for washing gas. Indeed, it could not be used for washing gas; it was too viscous. He could also tell of experiences where the exchange had been the other way; where the toluol had been added to the gas instead of being added to the tar. With such results as these, how could they go on? It was up-against them to find some way out of the difficulty. It was unworthy of us as Englishmen to go on trying to fight the war with such methods as these. He would tell them how to beat the Germans. The Germans would be beaten by more efficiency; by thoroughness; and by scientific and technical ability. If these methods were not adopted, we should never win the war, nor should we after the war win the commercial war. Therefore it was up-against us now, and immediately, to do something more than we are doing by the uncertain and stupid method of trying to wash gas with tar. There was present Mr. Walmsley, of Wombwell, who had some drawings illustrating how the method could be applied to quite small works, and he would now ask him to speak.

The Wombwell Plant.

Mr. WALMSLEY said the drawing showed the process at Wombwell in its essential details; but it was not quite the arrangement as in use at Norwich. The process was very similar to Mr. Glover's, except that the distilling of the benzolized oil was done in a direct-fired pot-still. No steam at all was used with the plant, except for the operation of the pumps for feeding the oil into the still, and also for the circulating pumps for the scrubber. Two storage tanks were required—and these could be old boiler shells—for storing the benzolized and debenzolized oil as Mr. Glover had described. The debenzolized oil was circulated over a scrubber; but he thought better results would be obtained by the use of a rotary washer-scrubber. This, however, was a detail that would have to be settled according to the works—having regard to the plant available. The oil was pumped over the scrubber and flowed into the benzolized oil-tank, from which it was pumped into the still, which it entered at the top. The debenzolized oil was taken away at the bottom of the still. The process was a continuous one—the pump continually pumped oil in, and it continually overflowed, passing through the cooler, which should be a serpentine or gilled pipe for preference. It then flowed back to the debenzolized oil tank for circulation again. The spray arrangement was the same as Mr. Glover's; and there was the same method of drawing off the water at the bottom and the spirit at the top. In his case, he had a vertical scrubber, and the whole of the ammonia was not abstracted from the gas before the process of washing; so that, instead of clean water, he got ammoniacal liquor. He intended, however, to remove the whole of the ammonia before starting oil-washing, and this should give pure water and spirit, instead of ammoniacal liquor. At present, the ammoniacal liquor was not wasted—it was collected in barrels, and taken to the ammoniacal liquor wells. The plant was very simple, and gave about 2¾ gallons of crude benzol per ton of coal carbonized. The benzol was sold to a local coke-oven plant for rectification; and he was getting 8d. per gallon for it. His works was a small one—about 7000 tons of coal being carbonized per annum—but taking (say) 10,000 tons, and selling the benzol at 8d. per gallon, would give a revenue of £1000; and deducting the operating costs of the plant, he was perfectly satisfied that there never had in his experience been such a commercial proposition for gas-works. He knew a particular works where a private individual had offered to put down a plant free of cost if they would provide the labour to work it and the crude spirit, and to give it to the works at the end of two years. If this sort of thing was going to be done, there was some "brassie" in it, as they said in Yorkshire. [Laughter.] This type of plant was suitable for small works, up to 40 tons carbonizing capacity per day; but beyond this it could not be done very well with one still. It then became a question of multiplying the stills; and so it was better on the whole to use steam. Perhaps it might be asked what effect this was going to have on the consumer. He had had the process in use since the middle of January this year, and there had not been a single complaint from any consumer. Two months before the process was started, he put posters on the hoardings and also circularized all the consumers by means of handbills, pointing out that the quality of the gas as far as illuminating power was concerned was going to be changed, and telling them to put in incandescent burners. A lot of people had done this, and there had not been a single complaint. He was quite sure that for incandescent lighting, the gas, now that it was stripped, was more suitable than it was before. He had been speaking to Mr. Glover on this matter, and agreed that it was a question of flame temperature. The gas as supplied after the process did not require so much air to consume it efficiently; consequently the temperature of the flame was not lowered, and thus a more intense heating effect on the mantle was obtained. Another point was in connection with naphthalene. In Yorkshire, he had had something like fifty or sixty complaints a day prior to the introduction of the oil-washing process; but the use of the process had absolutely eliminated naphthalene troubles. After the plant had been in operation a month, there had not been a single complaint of the stoppage of services from naphthalene. It might be asked what was going to be done with the plant after the war. His own view was that it would be retained—especially if a simple and inexpensive rectification plant could be designed, on a small scale, for the production of motor spirit. He was sure it could be done; and this would make the production of rectified benzol a good proposition for comparatively small works. A benzol plant of this type in operation at one of the local collieries near his works stood in a space of 12 feet by 12 feet, in a building which was only 15 feet to the eaves; and the little plant was dealing with the washing-oil from the carbonization of 250 tons of coal per day. Anyone interested in the subject would be willingly shown over the plant. In that case the heating was done by steam, instead of by direct firing as at Wombwell. The first still in the series could be heated by exhaust steam and the final heating by live steam.

Appreciative Remarks.

Mr. GLOVER, after thanking Mr. Walmsley for his description, said there were one or two points he would like to emphasize. The oil-washing ought to be either after the ammonia scrubbers, or better still, he had been told, after the purifiers. In his own case, he could not do this, but had put it after the ammonia scrubbers, and had suffered no inconvenience. If the mistake was made of putting it before the ammonia scrubbers, a loss of ammonia resulted; and there was also inconvenience from having to deal with the ammonia gas at a later stage. Another point was with regard to the quality of the gas. The heating value was only depreciated to a small extent; but the lighting value could be depreciated to any extent desired. At Norwich, he was not going to extremes at present. It could be carried very much further; but he had found this beneficial result—namely, that the further the stripping process was carried, the more sulphur compounds were removed from the gas, so that there was some compensation even in stripped gas. Ordinarily, the sulphur compounds at Norwich were 23 or 24 grains; but with oil-washing this had been brought down to 10 or 12 grains. This at any rate had the advantage of avoiding being pulled-up by the authorities for not purifying gas through lime. Another very good point was the absence of naphthalene; and he agreed that oil-washing was an absolute cure for this, although he could not say that there had never been any complaints on this account at Norwich. There had been paragraphs in the papers, one of which he might say was inspired by the Ministry of Munitions, that gas companies must not be expected at present to supply highly luminous gas, owing to the necessity for the extraction of benzol and toluol. One interesting result of this had been that he had received a complaint from a fried fish and potato merchant, saying that as the gas had not got its usual heating power, owing to what was being extracted from it, the Company ought to make him an allowance.

Mr. GLOVER then asked for any questions with regard to the plant.

Mr. FRANK PRENTICE (Ipswich) said that any points of doubt would be more satisfactorily dealt with after the inspection of the plant. Therefore he would merely content himself by proposing a vote of thanks to the Directors of the British Gaslight Company for their hospitality, and with them he would couple the name of Mr. Glover and also Mr. Walmsley. He might even go a little further; for Mr. Glover had introduced them to a company of distinguished gentlemen whom they did not often have the pleasure of seeing, and still less often did they have the opportunity of speaking to them. No doubt Mr. Halford and Mr. Gibb would be willing to answer any questions which might be put to them; and therefore in proposing a hearty vote of thanks to the Directors of the Company, coupling with them the names of Mr. Glover and Mr. Walmsley, he would ask them also to remember the other gentlemen to whom he had referred.

Mr. J. W. AUCHTERLONIE (Cambridge), who seconded the vote of thanks, remarked that Mr. Glover had not said how far he was carrying the reduction of his illuminating power. This was a point in which they were all concerned, because, notwithstanding what had been said as to incandescent burners, there were still a great number of flat-flame burners in use. He had a complaint not long ago, from one of his consumers (a shareholder and a councillor), who also asked for some reduction of his bill on account of what he understood the Company were taking away from the quality of the gas. This was the sort of thing that had to be contended with now. Of course, all who knew what was actually being done laughed at it; but the fear existed in the minds of the public, who thought that if the illuminating power was being reduced the gas companies were making something out of it. The Munitions Department ought to address a letter on the question to each of the statutory gas companies, and it might even use its influence to get the parliamentary standards reduced. At Cambridge he had a 16 candle standard; and the Council were jealous on this matter. At the present time the Council were not testing the gas; but there was a possibility of trouble, and as the Company could not go to Parliament for some time to get a reduction it

would help considerably if companies under statutory obligations were relieved of them so far as candle power was concerned.

Mr. GLOVER, in response to the vote of thanks, expressed his own pleasure at having his guests, and said that if anything he had done had advanced this national question by only a few degrees, he felt very well repaid. With regard to the question raised by Mr. Auchterlonie, it was quite true that there were more people using flat-flame burners than might be imagined; but there were very few cases in which the difficulty could not be overcome. The real point was to do everything possible to supply gas as cheaply as could be. The future of the gas industry was in selling gas with a high flame-temperature, because it was the heat of the gas on the mantle which was more important than the candle power of the gas, which was the old-fashioned rule. What was lost in the matter of candle power was gained in many other directions; and the abolition of the candle-power standard would be the emancipation of gas companies, who should not be tied down to the obsolete candle standard. This would make for the good of the community—gas companies and their consumers.

This concluded the proceedings at the luncheon.

A VISIT TO THE PLANT.

The Bishop's Bridge Gas-Works were then visited. The first noticeable feature of the plant is the extremely small space it occupies—the room taken up by everything, excluding the tanks, being only some 25 feet in length and 10 feet deep. Indeed this was all the space available; and the plant was designed to fit into it. Notwithstanding this, the apparatus is extremely accessible. It is dealing with about 120 tons of coal carbonized per day; and the approximate cost of it has been £1000, excluding the pipe-lines, tanks, and all connections. Mr. Halford intimated that any gas manager desiring to instal such an apparatus would be given all facilities from the Ministry of Munitions—the manufacturers being instructed that the plant must take precedence of all other work. Furthermore, Mr. Halford mentioned that it would even be possible to persuade the Treasury to allow the money required for the plant to be borrowed. A continuous stream of crude benzol was flowing—thus bearing out Mr. Glover's point that there is something very definite about the process. It was also pointed out that rectification has to be carried out with great care, owing to the very much greater stringency in the Ministry of Munition's specifications for benzol and toluol. At present benzol must not contain more than 7 per cent. of toluol, against 10 to 12 per cent. formerly. The subject of the possible co-operation among small gas-works, with the object of putting-up a rectification plant to deal with the crude benzol obtained from the various works—say, within a defined area—was freely discussed during the inspection of the plant; and some developments on these lines are not at all improbable.

The party were subsequently entertained to tea by Mr. Glover at his house; and though by this time some of the visitors had slipped away to catch trains, there was only one thought uppermost in all minds—that Mr. Glover's convincing demonstration marks an epoch in gas-works development, which will have an effect far beyond the four corners of the industry, and bring about that much-needed competition for the production of commercial motor spirit which has been so long desired. For the moment, however, the raw material for high explosives is the desideratum.

POSITION OF THE MANTLE TRADE.

[BY A DUTCH CORRESPONDENT.]

FROM certain articles which have lately appeared in the Press, it might be imagined by a layman that the British gas industry is in a less favourable position than before with regard to the supply of incandescent mantles, particularly where it is a question of price. The increase in the price of all kinds of mantles has caused some uneasiness. Mantle makers are said to have formed a sort of "ring," except for which prices in general would be somewhat lower. Some people, on the other hand, are of opinion that prices are kept up by German interests—that German interests still control the prices of monazite and thorium. If the latter assumption were correct, certainly the prices of these materials and of the finished articles would be much lower in Germany; and therefore it may be of interest to note the present position of the mantle trade in Germany.

According to papers published in that country, the German mantle makers met a few weeks ago in Berlin to discuss the question of prices. Though as recently as February of this year prices had been raised, the enormous further increase in the cost of raw materials and labour compelled the makers to face another rise in the prices of all sorts of mantles; and it was decided that the higher charges should start at the middle of April. At the present moment, quotations for German mantles are: Upright, 26 m. per 100 (= 37s. 6d. per gross); inverted 32 m. per 100 (= 46s. per gross).

Learning from the Press that British makers quote upright mantles at 39s. and inverted at 42s. per gross, we should say that, though the former are a trifle cheaper in Germany, the British consumers enjoy a considerable advantage so far as inverted mantles are concerned. On the Continent, the rise in prices has certainly not come to a stop. Germany is running fairly short of all sorts of materials used in the mantle industry; so that news within a little while of another rise in mantle prices would not be surprising.

The circumstances which have influenced the German industry, and independently of it also the British industry, have not left the Dutch market unaffected. On the contrary, in Holland, too, all materials have risen in price, and wages with them. Therefore, as cheap materials and low wages are things of the past, and stocks are practically exhausted, the Dutch mantle makers have to reconcile themselves to seeing profits considerably reduced. Some Dutch factories have already been obliged to raise their prices for certain types; and it is probable that within a short time the rise will be general.

SIXTY YEARS AGO.

From the "Journal" for May, 1856.

A Gas-Works Return.—The objections urged by several of the gas companies promoting Bills in the present session of Parliament, against the substitution of 12 for 10 standard sperm candles in the proposed model quality clause, have induced Mr. Brotherton, one of the Committee on Unopposed Private Bills, to move "for a return of all gas-works established under Acts of Parliament in England and Wales, and where situated—stating, in columns, the maximum charge per 1000 cubic feet of gas; the minimum charge per 1000 cubic feet; the material used; the average number of cubic feet of gas produced from a ton of coal; and the illuminating power of the light produced from an argand burner consuming 5 cubic feet of gas per hour, as compared with the light produced from sperm candles, six in the pound, and burning 120 grains per hour." This return was ordered to be made; and as it is a document which will be authoritatively cited, and may exercise considerable influence over the future course of legislation in respect of gas-works, it is of extreme importance that the returns made by gas companies should be carefully considered; and especially that there should be no exaggeration in the reports of the illuminating power of gas yielded by the different descriptions of coal.

Peace Celebrations.—The all-absorbing topic of interest to gas companies, Provincial as well as Metropolitan, is the illuminations appointed to take place in celebration of the Treaty of Peace. Judging from the preparations made, the power and efficiency of every gas-works will be severely tested; and we shall esteem it a favour if managers of large works will favour us with the statistics of the total quantity of gas supplied that night, in excess of their usual supply at this season of the year, and also state the maximum quantity delivered in any one hour. There seems, however, a circumstance connected with the arrangement of illuminating apparatus not unworthy the serious consideration of the gas-fitting interest, which is as follows: When gas-jets are arranged, as in many decorations—such as stars and crowns, where one jet must necessarily stand perpendicularly over another—it happens that the products of combustion from the lower jets extinguish the gas of the upper ones, and thus only the lower halves of such decorations are able to display themselves. This is easily avoided by inclining the plane of the jets at an angle, or, in other words, removing the base of the decoration a few feet or inches from the wall of the building, while the upper part is kept in contact with the wall. Thus the products of combustion from below do not interfere with the jets of gas burning above, and perfect combustion ensues throughout the whole of the jets, attended with a corresponding effect.

An Association of British Chemical Manufacturers.

By a representative meeting of the chemical and allied manufacturers in London last Tuesday, it was decided to form an Association of British Chemical Manufacturers, in order to meet German competition after the war. Mr. Charles Carpenter, D.Sc., who presided, said that German undertakings on a large scale had decided still further to strengthen their position by uniting. If the chemical industry in the United Kingdom was to be made what it once was, it could only be done by pooling their resources of money, men, ability, and brains. Sir William Pearce, M.P., urged the importance of research work; and Sir Edward Evans said they must be so organized as to be able to make demands, and not requests, to the Government. Mr. Brunner, M.P., spoke of the ignorance of Government Departments with regard to chemistry, and referred to a clerk in one department who, in figuring out imports, added carbonate of soda and nitrate of soda together, thinking that it did not matter. They should insist on the Government thoroughly equipping the Imperial College at South Kensington, which would in future be one of the most valuable assets of the chemical industry in the country. A committee was appointed to carry into effect the resolution passed—"That it is desirable that British firms engaged in the chemical and allied trades should form an Association to promote closer co-operation, and to place before the Government the views of the chemical trade generally, to further industrial research, and to facilitate closer co-operation between chemical manufacturers and various universities and technical schools."

SILICA AND FIRECLAY MATERIALS,

GIVING PRACTICAL EXAMPLES OF THEIR EXPANSION, CONTRACTION, AND REFRACTORY QUALITIES.

By JOHN WEST, M.Inst.C.E., M.I.Mech.E., &c., of Manchester.

[A Paper read before the Manchester District Institution of Gas Engineers, Saturday, May 27.]

I have been invited by your President and Council to read a paper before this Institution upon the important question of the refractory materials and their behaviour under heat of fire-resisting materials used in retort-settings in gas-works. It is a study which has always had an intense interest for me throughout my long connection with the gas industry, and it is one which all gas engineers should more than ever to-day place to the fore-front—more than ever because the costs of maintenance and renewal are anything but negligible quantities in the economy which is so essential in these days of higher costs in all directions and of stern competition.

The profit and loss account of all gas undertakings is—I am speaking of normal times, not of prevailing war conditions—mainly dependent upon the successful results obtained with the carbonizing plant, the successful operation of which is absolutely contingent on the behaviour of the fire-resisting materials employed in its construction. Hence, the paramount importance of a full and practical knowledge of these materials.

It will be admitted that until recent years this question, which is of so much importance to our industry, had not received the consideration and investigation that it deserves; and it is largely due to the great change and improvement in carbonizing methods that it has been forced upon our attention. The paper read by Mr. F. J. Bywater a few years ago before the Institution of Gas Engineers was, to all intents and purposes, an appeal to gas engineers and manufacturers no longer to allow the detrimental neglect of the question to continue; and the fact that a Refractory Materials Committee was formed (which has since done, and is still doing good work) has added very considerably to the recognition of the weight and importance of this special subject.

EARLY EXPERIENCES.

It has been thought that I might serve the interests of this Institution and the profession generally by giving you my personal experiences relating to refractory materials, coupled with some results of the many experiments I have made, extending over a period of fifty years. It was my good fortune to be articled to an engineer whose father was one of the pioneers in the introduction of fire-clay bricks and retorts. These retorts were circular in form, and were made in iron moulds about 4 ft. 6 in. long. After the fire material had been ground and properly graded and worked into a proper plastic condition, it was thrown by hand in small pieces into these moulds, and rammed with small rammers to make them solid; and, after being well dried and properly burnt throughout, an excellent retort was produced. This method of nearly sixty years ago yielded a retort that compared favourably with the fire-clay retorts manufactured to-day.

In those early days, a considerable period was absorbed, and much difficulty was experienced, in overcoming the prejudice against fire-clay retorts. Consequently, the substitution of fire-clay for cast-iron retorts was a somewhat slow process. The pioneer makers of fire-clay retorts exercised very great care in the manufacture; and certainly they were not hampered by the excessive and undue competition which, in recent years, has not tended to produce the best results.

My training as a gas engineer emphasized the imperative necessity of obtaining the best fire-goods for retort-settings. While in charge of the Maidstone gas undertaking, I erected, for experimental purposes, a small working plant; and inasmuch as it was necessary to let the retort down rather more frequently than is customary in ordinary practice, it was requisite that the very best retorts obtainable should be used. After consultation with a retort maker (whose instructions were to produce, regardless of cost, the best retort he could manufacture), an excellent article was made. The retorts were costly; but, in comparison with others of inferior materials, they were in the long run the cheapest. This is an indication that excellent retorts could be realized at least forty years ago.

TENDERS WITHOUT SPECIFICATION OF QUALITY—AND A CHANGE.

After being appointed Chief Engineer to the Manchester Corporation Gas Undertaking—this is looking backwards for many years—one of my first duties was to arrange for the building and re-setting of retort-settings for the then ensuing winter. The retorts and fire-goods for the purpose had already been delivered. Upon inspection of the retorts, they were found very defective and insufficiently burnt, and deserved to be rejected. They had, however, been paid for; and there was not sufficient time to obtain new ones. So, reluctantly, they had to be used.

The purchasing methods employed by the Gas Committee, of advertising and inviting tenders for so many thousand feet run of retort, without any definite stipulations as to the quality of the materials they were buying, appear very extraordinary, and very wrong; but they were not the only corporation or company who were following this bad system of purchasing retorts and other fire materials. You will, I am sure, agree with me that such a practice could only be conducive to inferior and low-priced material being tendered for; and it was certainly no encouragement to good firms to manufacture the best possible material. I found that under these loose advertising conditions, with quality not being properly taken into consideration, many firms would not quote for their best goods.

However, reverting to the defective retorts which had been delivered, I reported the matter to the Gas Committee, pointing out the loss that would be sustained by using such bad quality material; also that, instead of haggling over a 1d. per foot extra for retorts, an additional 1s. per foot was not a large matter if the full value was put into the retorts; further, that the cost for labour was about the same for setting a good retort as a bad one; and, moreover, there was great loss of gas, owing to the contraction of the inferior retorts and their exceptionally short life.

At the same time I recommended that the old and pernicious system of inviting tenders should be dispensed with, and, as an experiment, that the Committee should invite tenders from four well-known firms of good repute, each for ten settings of through retorts of the best quality, with the view of testing the materials under the same conditions, and to encourage the makers to do their very best as to quality. The makers were told that future orders would depend upon the result of these tests. Naturally, we had to pay more than formerly for the better retorts; but the working results were very satisfactory indeed. The retorts lasted fully double the time that the former inferior and low-priced retorts had done; and the annual saving, as the result of decreased maintenance charges, was very considerable. My long experience prompts me to say that I know of no more important duty for an engineer than to advise his committee as to the best retorts and material to be purchased. And he can only arrive at a proper conclusion by careful experiment and continuous investigation as to realizable efficiencies.

REFRACTORINESS AND THE CLAIMS OF HIGHER TEMPERATURES.

The advent of gaseous firing enabled us to obtain higher heats in retort-settings. Consequently, retorts and bricks of greater fire-resisting quality were required to obtain, without destroying the settings, the full advantages of the higher temperatures employed; and greater use was therefore made of silica fire goods, on account of their higher refractoriness, especially in the combustion portion of the settings and around the underside of the retorts.

About 25 years ago, I commenced to turn my attention particularly to the manufacture of silica bricks, and was instrumental in the establishing of a brick-works for the purpose in Derbyshire. During this period, many and varied experiments have been made with a view to obtaining a reliable silica fire-brick. The experience has been extremely interesting—the subject, though surrounded by many difficulties, being an absorbing one. The difficulties as time proceeded have, I venture to submit, been successfully overcome.

MANUFACTURE OF SILICA GOODS.

As you are no doubt aware, most silica bricks expand, while ordinary fire-goods contract, very materially when subjected to high temperatures; and you will appreciate that both these features are very objectionable. A long time ago I came to the conclusion that all fire-goods should be made, as far as possible, so that expansion and contraction should be at the minimum; and I also believed that, by careful and steady experimenting with various mixtures, this much-desired result could be achieved. As you, of course, know, silica goods are difficult to manufacture, owing to the very small percentage of binding material permissible in their composition.

Most of the silica obtained from the pits in which I am interested in Derbyshire is proved by analysis to be very pure. It contains about 96 per cent. of silica; so that there is a very good margin for manufacturing highly refractory bricks. After many experiments, we succeeded in making an excellent and high refractory brick, which, in the experimental furnace, did not show any signs of expanding or contracting. Samples of the bricks were sent for testing to Dr. J. W. Mellor; and he stated that the material neither expanded nor contracted at cone No. 12, 1350° C. (2462° Fahr.). These non-expanding silica bricks have for many years past been used by me in horizontal settings, particularly in those positions exposed to the greatest heat, with the results that the combustion chambers have practically retained their original shape under high temperatures, and retorts have remained true. The importance of these features, especially with retorts operated by stoking machinery, will be appreciated.

IMPORTANCE OF PROPER SELECTION.

The question of the expansion and contraction of refractory materials is a very serious and important one; and it is only by great care and frequent observation that a decision can be arrived at as to the actual behaviour under the working conditions, more particularly in respect of the load put upon the material at high

temperatures. To make a suitable selection of materials for use in the various forms of retort-settings is, therefore, a difficult problem, particularly in these days of high temperatures, where there is a combination of silica and ordinary fire-clay goods in a setting; the silica having a tendency to expand, and the fire-clay a tendency to contract—two distinct variations troublesome to deal with.

In my experience, I know of many cases where serious failures have occurred through the combination of unsuitable materials. It is important that proper materials for supporting retorts immediately above and around the combustion chamber should be provided. It will be within the experience of more than one of us that, even with suitable silica materials in combustion chambers, and with first-class retorts, retorts have sunk out of line, due to the contraction of the fire-clay material supporting the retorts. This difficulty has resulted in an extended use of silica materials in these critical positions.

Problems Special to Vertical Retort Settings.

The development of the Glover-West vertical retort system has presented some fresh problems with regard to the selection of the most suitable refractory materials to meet new circumstances. Very particular attention has been paid to the obtaining of the best hand-made fire-clay retorts for the "verticals;" and it has been possible to introduce materials subject to very little expansion or contraction under working conditions. The difficulties previously referred to, of blending silica and fire-clay materials, have, however, presented themselves in the development of the system; and recent experiences suggest the more general use of silica segmental made retorts.

The first Glover-West installation into which segmental silica retorts were introduced has now been in active operation for 1165 days. A recent inspection indicated that the retorts were still in excellent condition; and, apart from a probable long life, there are advantages in the letting up and down of the retorts. They will stand higher temperatures; and, consequently, a larger output per retort is obtained. The first cost is somewhat heavier compared with fire-clay retorts; but this will be balanced by longer life.

Preference at Sheffield and Some Tests.

I understand that the Sheffield Gas Company have used segmental silica fire-blocks for horizontal retorts for a more extended period, and in larger quantities, than any other gas-works in Great Britain. This extensive practical experience should be very valuable to us. Mr. Morrison has informed me that the silica bricks used in their retort-settings contain about 85 per cent. of silica, and that for this special purpose he prefers these blocks to those containing a larger percentage of silica. After deciding to read this paper, I asked Mr. Morrison if he would let me have some samples of the bricks for testing; and he kindly consented to do so. I have had the bricks analyzed, and tested for refractoriness; and the results are as follows:

	No. 1. Per Cent.		No. 2. Per Cent.
Silica	87·23	..	90·20
Titanic oxide	1·85	..	0·38
Alumina	8·55	..	6·12
Ferric oxide	1·25	..	1·50
Manganese oxide	—	..	—
Magnesia	0·10	..	0·21
Lime	0·28	..	0·38
Potash	0·54	..	0·54
Soda	0·36	..	0·73
Loss	0·25	..	0·22
Refractory test	Cone 27–28 = 1610° to 1630° C. = 2930° to 2966° Fahr.	..	Cone No. 30 = 1670° C. = 3038° Fahr.

There is no doubt that a class of material containing about 85 per cent. of silica is the most suitable for segmental horizontal retorts, on account of the small amount of expansion, and preferable to a material containing 95 per cent. of silica with its higher expansion.

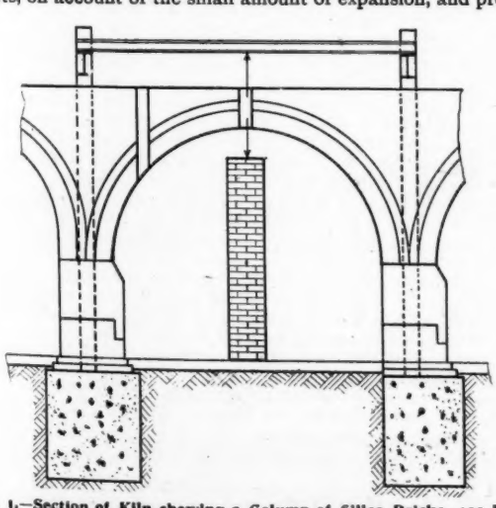


Fig. 1.—Section of Kiln showing a Column of Silica Bricks, 100 Inches High, and Method of Measuring the Same from an Independent Fixed Bar.

Expansion of Retort-Benches—Practical Experiment.

Reference has already been made to the tests by Dr. Mellor of the Derbyshire made bricks, which, tested separately, show practically no expansion or contraction. In practice, however, it is found, taking a vertical retort-bench as a whole—the settings being built with silica materials and the retorts of fire-clay—that there is a total expansion under working temperature of 2 inches in the height of a vertical retort-bench, 21 feet overall. This circumstance indicates the difficulty of minutely gauging, and of accurately arriving at, the expansion or contraction of any single brick, and suggests, in addition to the laboratory test, a test being made on a large scale of practical character.

A test on the following lines was therefore carried out [fig. 1]: A column of silica bricks, 100 inches in height, was built inside one of the kilns in which the bricks are burnt off; this more nearly representing practical working conditions. Careful measurements were made when the kiln temperature reached 2600° Fahr., and again when the kiln was let down and was in cool condition. The brick column was built just under the cooling hole in the crown of the kiln; and the measurements were taken by fixing a permanent iron bar some distance above, and clear of the kiln over this hole. By means of this bar accurate measurements from the top of the column were taken from time to time under the varying temperatures. The result of this test revealed the fact that the column of bricks expanded to 100⅞ inches at the temperature before mentioned. This expansion, which very nearly coincided with the expansion of settings working under normal conditions, is, however, extremely low for silica bricks in bulk, and is easily provided for. Both in this country and abroad there are silica materials the expansion of which is more than double that shown by the foregoing figures, and which produce considerable distortion of the retorts. The simple method described of carrying out a practical test is worthy of consideration; and it can be performed at very little expense.

There appears to be an idea prevailing in some quarters that the higher the percentages of silica in the article manufactured, the greater the refractoriness. There is one thing certain, that, as a rule, the higher the percentage of silica, the greater the expansiveness; and very special provision has to be made to meet this exceedingly objectionable feature. My experience does not bear out or support the theory as to the higher percentages of silica denoting higher refractoriness. On the contrary, one can get much better results with a smaller percentage of silica, when mixed previously with other suitable ingredients which improve the quality of the material, with the advantage that it is less liable to crack or crumble when cooled down. At the same time, the objectionable feature of expansiveness, which is so liable to disturb the settings, is to some extent eliminated.

Load and Pressure on Bricks under Heat.

The question of load and pressure on bricks when working at high temperatures in the settings is a very important matter; and it can only be satisfactorily determined by testing under working conditions and by close observation. In practice, it has been found in many cases that, although some silica and fire-clay bricks as tested in the laboratory give very high refractory results, this does not indicate full proof of their remaining stable under load and at normal working temperature. This important question is, however, now receiving more general and special consideration than formerly.

In some recent tests by Dr. Mellor, it was shown that high refractoriness is not a true criterion of the working value of bricks when tested with a load under heat. He mentions, as an example, a sample made of china clay, which is highly refractory when tested in the furnace in the laboratory, and will stand under heat cone No. 35, or a temperature of 1770° C. (3218° Fahr.), but will

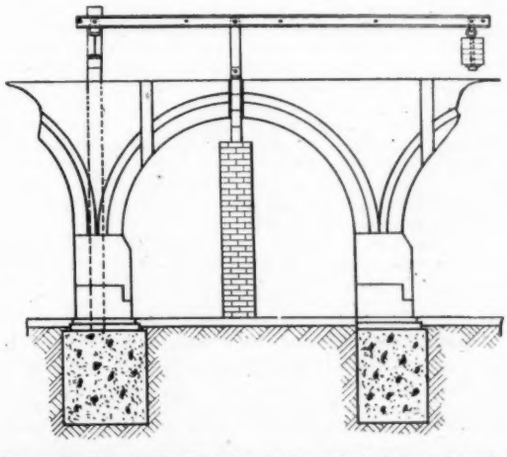


Fig. 3.—Section of Kiln Showing Method of Applying a Load to a Heated Brick or Column of Bricks.

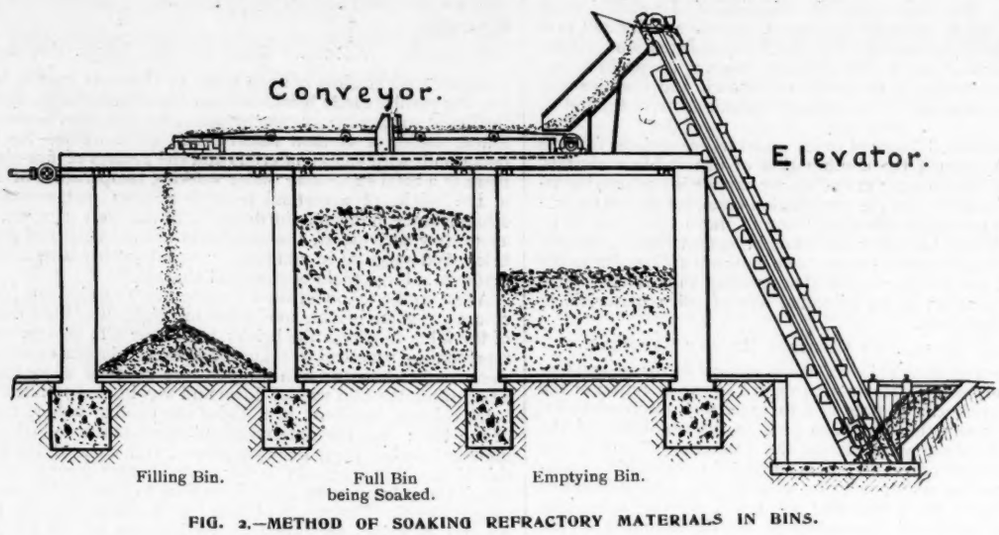


FIG. 2.—METHOD OF SOAKING REFRACTORY MATERIALS IN BINS.

give way under load at cone No. 14, or 1410° C. (2570° Fahr.). Some of the best fire-clay bricks, which will stand cone No. 32 or 1710° C. (3110° Fahr.), will give way under load at cone No. 15, or 1435° C. (2615° Fahr.); and others will give way at cone No. 12, or 1350° C. (2462° Fahr.). He found, however, that a silicious brick, which would stand the test of cone No. 34, gave a refractoriness of 1750° C. (3182° Fahr.), and did not with the same load, as in the former tests, give way until cone No. 26 was reached, or 1580° C. (2876° Fahr.).

DR. MELLOR'S *Tests of Materials under Load and Temperature.*

Kind of Material.	Yield Temperature.	Fusing Temperature
China clay	Cone 14 1410° C. 2570° Fahr.	Cone 35 1770° C. 3218° Fahr.
Best fire-clay bricks	Cone 15 1435° C. 2615° Fahr.	Cone 32 1710° C. 3110° Fahr.
Silicious brick	Cone 26 1580° C. 2876° Fahr.	Cone 34 1750° C. 3182° Fahr.

These tests go to prove conclusively the superiority of silicious bricks for standing heavy loads in actual practice at high temperatures. The tests also show that, with the best fire-clay goods, and the temperatures often employed, the danger zone is frequently approached; and this is an indication that there is a limit to the temperature which must not be exceeded. It therefore becomes necessary that watch should be very carefully and continuously kept over the practical working of retort-settings when running at high temperatures, or there will be risk of collapse—a disaster of which probably some of you have had a little experience.

A SIMPLE PRACTICAL TEST.

For many years past I have made a practice of testing and comparing bricks under load or pressure by placing them side by side in a furnace. As the heat of the furnace increases, at a certain temperature, which is indicated by Seger cones, the two pieces of brick are taken up with a pair of tongs and pressed together. The tongs will make an indent on one of the two pieces of brick, or in some cases they may tumble to pieces. I have several samples of the effects produced with these bricks under this test. All the samples before being tested showed a refractoriness of about cone No. 33, or 1730° C. (3146° Fahr.). Some of them softened or crumbled at very low temperatures. There was one brick, however, that withstood this load test far in excess of all others. This was a silicious brick; and it began to glaze at the temperatures of cones Nos. 27 and 28, or 1630 C° (2966° Fahr.). This gave the best results of any bricks that I have ever tested under load and working conditions.

I may say that I have recently had tested in a kiln a whole silicious brick, with upon it a load of 84 lbs. to the square inch at a temperature of 2600° Fahr.; and the load did not have any effect upon it.

MANUFACTURE OF SILICA BRICKS AND RETORTS.

It may be of interest at this stage to give a brief outline of the manufacturing process at the silica fire-brick works at which the experiences referred to have been gathered. The silica raw material is obtained from three pits, and is carefully selected and graded before being stored in separate sheds. Four qualities of silica goods are manufactured from these raw materials, after being properly mixed with other necessary ingredients, and are as follows:

For Steel-Furnace Works.—Bricks and blocks containing from 93 to 95 per cent. of silica. Test for refractoriness, from 1730° to 1770° C. = 3146° to 3218° Fahr.

For Gas-Works.—(1) Special for segmental retorts; bricks and shapes containing from 91 to 92½ per cent. of silica. Test for refractoriness, from 1710° to 1750° C. = 3110° to 3182° Fahr. (2) "B.B." quality, containing from 89 to 91 per cent. of silica. Test for refractoriness from 1650° to 1690° C. = 3002° to 3074° Fahr. (3) Ordinary bricks, containing 85 to 88 per cent. of silica. Test for refractoriness, from 1610° to 1630° C. = 2930° to 2966° Fahr.

The silica material is ground with a small proportion of grog, &c.; all being mixed and ground together, in perforated pans, and screened to size. Afterwards the material is delivered into large bins (which is a departure from the ordinary practice) where it is saturated with the necessary quantity of water [fig. 2]. It remains soaking in these bins for about a week; so that the very small and minute particles of clay mixed with the silica become thoroughly saturated, and worked well around the silica sand and quartz. In this way the whole mass becomes semi-plastic, and is, in consequence, more easily manipulated during manufacture. Very considerable importance is attached to this method of manufacture, as it improves the quality of the materials, by giving it a definite and fixed combination throughout.

The moulded materials are then laid upon iron or cement hollow floors, the undersides of which are heated by waste or live steam. When carefully and thoroughly dried, they are placed in the kilns, where they are well burnt-off at a temperature higher than they will have to withstand in ordinary gas-works practice. I consider that all fire goods should be burnt off in this manner, although the coal consumption of the kilns is increased.

I have had a large number of tests made on both silica and fire-clay materials for refractoriness, expansion, and contraction; and the details and analyses are appended in the following tables. Tests have also been made for expansion and contraction with load under heat. It will be observed that generally the tests conform to the Refractory Materials Committee's specification.

QUALIFIED TESTINGS, &C.

The Refractory Materials Committee have, in their specification, formulated standards [see Appendix] for the refractoriness of both silica and fire-clay materials, as well as special rules for testing. I believe that these standards have been worked out with the assistance of the Committee's Technical Adviser, Dr. Mellor, the principal of the Staffordshire County Pottery Laboratory, and they are certainly very reliable standards. I may say that Dr. Mellor has been testing samples of bricks and retort materials for us for many years past, and long before he was associated with the Refractory Materials Committee; and all the test results I have put before you have been made by him, and under the same conditions.

May I suggest to you that, in making your own experiments, the Committee's testing rules should be carefully followed, or, if you prefer to get materials analyzed and tested by experts, you should obtain some knowledge of their reliability for, and experience in, this special kind of work. My reason for this advice and warning is that there are statements in circulation as to certain goods, which statements would show a considerable difference if the materials were tested by Dr. Mellor. Several cases of this kind have come under my notice.

AMERICAN PRACTICE.

At the Liverpool meeting of the Institution of Gas Engineers, you will remember Mr. F. J. Bywater presented some interesting

TABLE I.—*Various Kinds of Silica and Silicious Materials Manufactured in England and Wales, giving their Analysis, Refractoriness, and Expansion.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Silica	93·20	91·60	92·12	93·32	96·44	87·23	89·27
Titanic oxide	0·44	0·46	0·31	0·29	—	1·85	0·77
Alumina	4·18	6·32	3·09	2·40	1·56	8·55	8·53
Ferric oxide	0·36	0·30	0·75	0·99	0·50	1·25	0·84
Manganese oxide	—	—	—	—	—	—	—
Magnesia	0·24	0·21	0·08	0·17	0·01	0·10	0·23
Lime	1·48	0·26	2·76	2·42	1·10	0·28	—
Potash	0·36	0·85	0·26	0·38	0·22	0·54	0·20
Soda	0·02	0·18	0·50	0·32	0·20	0·36	0·30
Loss	0·08	0·09	0·12	0·14	0·04	0·25	0·05
Refractoriness	Cones 33 to 34 1730° to 1750° C. 3146° to 3182° Fahr.	Cone 33 1730° C. 3146° Fahr.	Cones 31 to 32 1690° to 1710° C. 3074° to 3110° Fahr.	Cones 32 to 33 1710° to 1730° C. 3110° to 3146° Fahr.	Cones 33 to 34 1730° to 1750° C. 3146° to 3182° Fahr.	Cones 27 to 28 1610° to 1630° C. 2930° to 2966° Fahr.	Cone 31 1690° C. 3074° Fahr.
Expansion when heated at a temperature of 1435° C. —2615° Fahr.	Expansion Per Cent. $1\frac{3}{8}$	Expansion Per Cent. $\frac{7}{8}$	Expansion Per Cent. $1\frac{1}{8}$	Expansion Per Cent. $2\frac{3}{16}$	Expansion Per Cent. $2\frac{1}{4}$	Expansion Per Cent. not tested	Expansion Per Cent. $\frac{1}{4}$

TABLE II.—*Various Kinds of Fire-Clay Materials Manufactured in Great Britain, with their Analysis, Contraction, and their Refractoriness.*

—	(8)	(9)	(10)	(11)	(12)
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Silica	64·95	68·12	66·16	58·36	61·98
Titanic oxide	1·79	1·32	2·50	1·28	1·39
Alumina	26·96	25·42	27·47	32·93	31·43
Ferric oxide	4·63	2·75	2·17	5·50	2·19
Manganese oxide	—	—	—	—	—
Magnesia	0·07	0·22	0·04	0·56	0·47
Lime	0·28	0·36	0·51	0·55	0·31
Potash	0·99	0·88	0·93	0·68	1·38
Soda	0·36	0·32	0·38	0·16	0·38
Loss	—	0·18	0·27	0·20	0·25
Refractoriness	Cone 31 1690° C. 3074° Fahr.	Cones 30 to 31 1670° to 1690° C. 3038° to 3074° Fahr.	Cone 30 1670° C. 3038° Fahr.	Cones 30 to 31 1670° to 1690° C. 3038° to 3074° Fahr.	Cone 31 1690° C. 3074° Fahr.
Contraction after being heated to 1435° C.—2615° Fahr.	Contraction. Per Cent. $1\frac{1}{4}$	Contraction. Per Cent. $1\frac{3}{8}$	Contraction. Per Cent. $\frac{3}{4}$	Contraction. Per Cent. 1	Contraction. Per Cent. $2\frac{1}{4}$

information he had obtained from the American Gas Institute as to the manufacture of silica fire-goods in America. Having made several visits to the United States, I have had the opportunity of keeping in close touch with this development. About fifteen years ago, I made arrangements with Mr. H. A. Carpenter, the Vice-President of the Riter-Conley Manufacturing Company, of Pittsburg, to introduce retort stoking machinery for horizontals into the United States; and inasmuch as I was not impressed with the manufacture of fire-goods in that country, we agreed that it would be advisable—especially with the first installation of the machinery—to send out some of our own special silica material

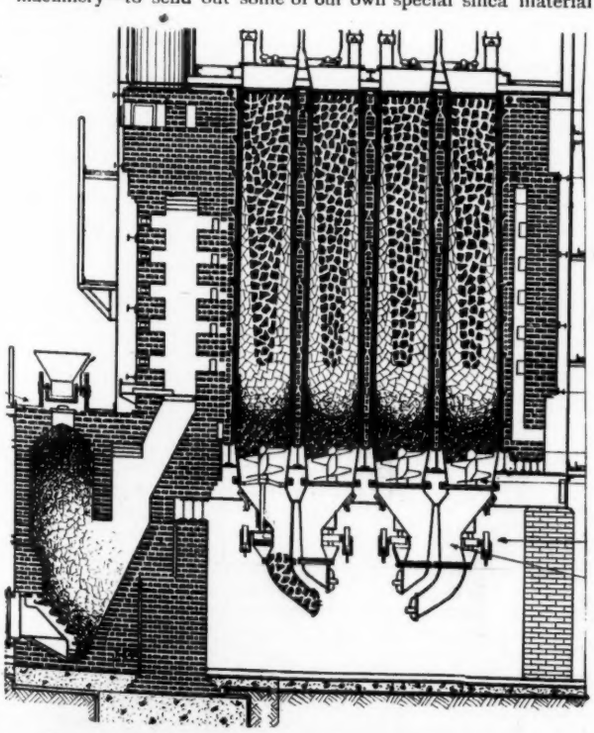


Fig. 4.—Vertical Retort Setting with Silica Segmental Retorts.

for use in some of the combustion chambers and important parts of the settings. As an example, two through settings were erected with English materials at Milwaukee, and the remaining settings were built with materials obtained in the States.

It had been decided to work the settings at tolerably high temperature, so as to secure good results. This is necessary; for, as a rule, the American coals require higher heats to extract from them a good make of gas per ton than is required with English coals. After the retorts had been working a short time, some of the combustion arches began to give way, and the retorts were so let down that it was difficult to work the machinery, except with the two settings built with the English silica materials. These settings remained perfectly true, and stood the tests satisfactorily.

After this experience with the ordinary fire-clay material of the States, it was decided to make some experiments with the best German materials; and some special silica material manufactured in the States especially for the purpose. The experimental settings with the German materials gave way under the high temperatures required. Experiment was then made with special silica materials produced in the States. These were found quite satisfactory in regard to the withstanding of high temperatures; but the objectionable feature was the considerable expansiveness, which had to be allowed for by providing paper joints and other special expedients. It was also decided to build retorts with segmental silica blocks; and these were designated the "Ricon" material. These settings, with the segmental blocks, represented the very first application in the United States of high percentage silica to all the retorts in a bench for the production of coal gas, as shown in fig. 5.

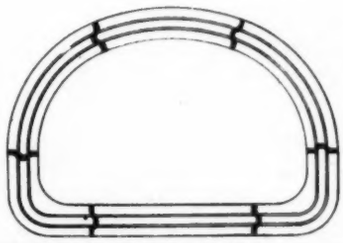


Fig. 5.—Original Design of "Ricon" Silica Segmental Retorts erected at Milwaukee, U.S.A.

About this time, another installation was made at Lowell; and the combustion chambers of five through arches were built with our own English materials, while other five arches were built of German productions. The combustion arches constructed of

English material remained perfectly true during their lifetime, while the ones erected with the German material gave way. Other settings were built with the "Ricon" silica materials at Newhaven and Astoria, New York.

At Worcester (U.S.A.), a further advance was made; the retorts being constructed with a larger number of smaller segments—as shown in fig. 6. There all the cross walls and everything in connection with the settings were of the "Ricon" silica materials.

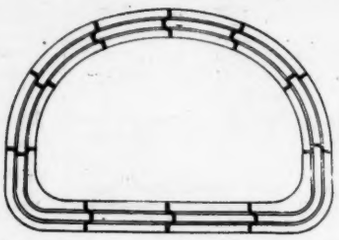


Fig. 6.—Improved Design of "Ricon" Silica Segmental Retorts erected at Worcester, U.S.A.

The new plant was put into operation in October, 1908; and I am informed that the settings are in good order and successfully operating to-day. The only repairs necessary have been due to the floor blocks of the retorts having been worn away by the pushing operation in discharging. The blocks were cut out and replaced by new ones.

Mr. Carpenter, after continually studying the question of expansion and contraction of the settings, devised special and ingenious means for taking up the expansion, which enabled him to construct the retorts with fine silica materials. At the same time, he decided that all the bricks should be machine ground, so as to ensure very accurate fitting and thin joints. This special fitting also materially reduced the cost for labour in building the settings; and this is a very important factor in the States, where the cost of labour is very high. Mr. Carpenter also invented a common take-off main and pipe for a large number of retorts, which enabled the construction of retort-benches containing a greater number of retorts than heretofore. These settings are shown in fig. 8.

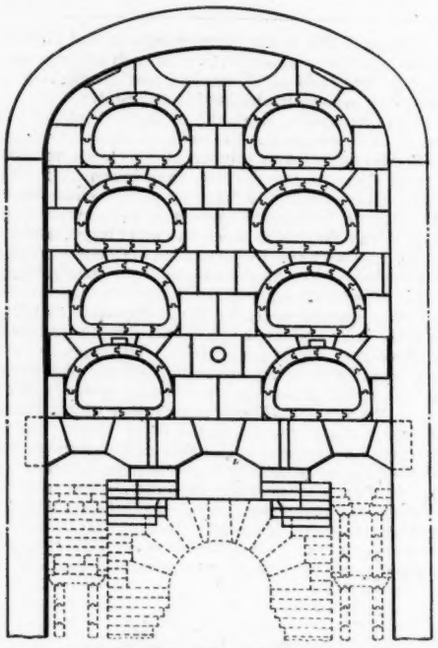


Fig. 7.—Sectional Elevation of Four Tiers of Eight Retorts in a Setting. The Cross Walls, Segmental Retorts, and the Blocks being Built entirely with the "Ricon" Silica Materials.

The two illustrations—fig. 7 and fig. 8—kindly supplied by Mr. Carpenter for this occasion, show the gradual progress that has taken place in America during the past fifteen years; and that there has been an advance from settings of four tiers of retorts to settings of eight tiers. I think you will agree that this is a good record of pioneer work in the States.

Mr. Carpenter has also forwarded me a full-sized section of a segmental retort with ground faces, as shown in fig. 8, which is here for your inspection.

German v. British Productions.

Much has been said and written about the alleged superiority of German made retorts and other fire materials; and a few words may not be out of place here on the subject. There is no doubt that the Germans have made (as in the case of many of their other industries) a special study of fire-brick production and retort-bench construction; and in this they have been assisted very much by German gas engineers and scientists. Cost, too, has not been regarded; for in that country makers get higher prices, *pro ratâ*, for their goods than is obtainable in England. It is acknowledged by all who have studied the matter that there is as good material in Great Britain as there is in Germany, and

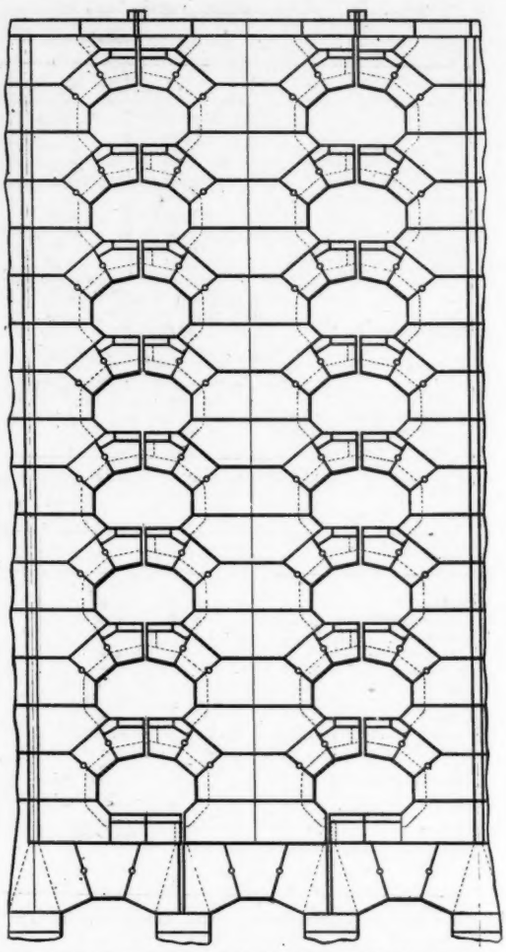


Fig. 8.—Sectional Elevation of Eight Tiers of Sixteen Retorts in a Setting. The Cross Walls, Segmental Retorts, and Blocks being built entirely with the "Ricon" Silica Materials; and Showing the Allowance of Space necessary for taking-up the total expansion that takes place in Settings when heated-up. All the Segmental Blocks are ground by machine to a true face to make a perfectly true joint.

American Silica Materials.

Table III.—*Analysis, Expansion, and Refractoriness.*

—	(13)	(14)	(15)
	Per Cent.	Per Cent.	Per Cent.
Silica	96·34	95·40	96·40
Titanic oxide	—	—	—
Alumina	1·35	1·48	1·14
Ferric oxide	0·44	0·44	0·56
Manganese oxide	—	—	—
Magnesia	0·09	0·07	0·09
Lime	1·51	1·78	1·58
Potash	0·34	0·14	0·22
Soda	0·22	0·20	0·12
Loss	0·17	0·12	0·14
Refractory test	Cones Nos. 33-34 1730° to 1750° C. 3146° to 3182° Fahr.	Cone No. 33 1730° C. 3146° Fahr.	Cone No. 33 1730° C. 3146° Fahr.
Expansion when heated at a temperature of 1435° C.-2615° Fahr.	Per Cent. $1\frac{3}{8}$	Per Cent. $1\frac{3}{8}$	Per Cent. $1\frac{3}{8}$

their other industries) a special study of fire-brick production and retort-bench construction; and in this they have been assisted very much by German gas engineers and scientists. Cost, too, has not been regarded; for in that country makers get higher prices, *pro ratâ*, for their goods than is obtainable in England. It is acknowledged by all who have studied the matter that there is as good material in Great Britain as there is in Germany, and that it is only a question of bringing scientific and practical experience into the manufacture to produce finished goods which will compare more than favourably with those of German make. With every confidence, I say that British manufacturers will rise to the occasion and maintain their position.

With the kind of material made in Germany I have some personal knowledge. Mr. Irminger, the Chief Gas Engineer of the Copenhagen Municipality, some years ago made very exhaustive experiments in his combustion chamber arches with the best German materials, against the Derbyshire silica bricks. While

the German materials gave way, the Derbyshire materials kept their original form, and only became glazed on the outer surface. I communicated with Mr. Irminger recently on this subject; and he replied as follows: "Attention may be called to the arches in the combustion chambers of our setting being of silica blocks and bricks throughout; and this prevents the retorts which are supported by them from sinking, as the silica material expands very little. Arches of ordinary clay bricks of the best German materials have been found to sink more than 6 inches; the bricks in my opinion not being burnt at a sufficiently high temperature, and contraction subsequently takes place. Since we commenced, many years ago, the use of Derbyshire silica fire-bricks in our arches, where the highest temperature prevails, we have never found any sinking of the 20 feet long retorts supported by the silica arches—the duration being equal to or more than the retorts (say, about 1500 days); while with the best German materials the duration was only some 100 days, on account of the sinking of the retorts, which prevented the use of stoking machines."

Mr. Irminger also said that he thinks it impossible to obtain reliable tests with fire-bricks after only a few hours' trial in a laboratory in an ordinary atmosphere, and that it is a question of time, together with the chemical action at high temperature by different gases. Both these factors can only be realized in actual working over a year or more. He goes on to say: "I have experimented very often by placing bricks in the combustion chamber from 200 to 300 days; and when the ovens are cooled-down to make a thorough examination of them. The best proof is I have found some of the best German clay retorts may go very well for some months, but they afterwards commence to shrink. Therefore, long-time proof is necessary." I quite endorse Mr. Irminger's views, and know of other engineers who are of the same opinion.

Life of Retorts.

The general way of expressing the life of a retort is to state the number of days it has been at work. I consider such a statement very misleading and erroneous, unless some account is given of the quantity of coal carbonized, or the volume of gas produced during the life of the retort. It sometimes happens that a long life is due to the retort being worked at low temperatures and producing very poor carbonizing results; whereas a retort working at a good temperature may, with a considerably less number of days in action, have carbonized more coal, and produced a larger volume of gas during its lifetime.

Conclusion.

In conclusion, it is hoped that our united endeavours will result in manufacturers being induced by encouragement to produce the best possible materials, with due consideration to quality rather than low prices. Good quality must have a tendency to increase first cost; but the increase will disappear automatically with long life and reduced maintenance charges. I am sufficiently optimistic to believe that the continued investigations of the Refractory Materials Committee, in conjunction with the practical experience and assistance of British makers, will place this important feature of the structural and manufacturing sides of our industry in a sound and unassailable position.

One word more. If in this paper I have spoken much of the Derbyshire silica material, I know you will forgive me, seeing that it is upon it that my work of latter years has been concentrated, and it is from, and with, it that my experience as to physical requirements has been gained.

APPENDIX.

Extract from

STANDARD SPECIFICATIONS FOR REFRACTORY MATERIALS.

(REFRACTORY MATERIALS COMMITTEE).

Fire-Bricks, Blocks, Tiles, &c.

Refractoriness.

Clause 1.—Two grades of material are covered by the specification.

(1) Material which shows no sign of fusion when heated to a temperature of not less than Seger cone 30; about 1670° C. (3038° Fahr.).

(2) Material which shows no sign of fusion when heated to a temperature of not less than Seger cone 26; about 1580° C. (2876° Fahr.).

Silica and Silicious Bricks, Blocks, Tiles, &c,

Refractoriness.

Clause 1.—Test-pieces of the material shall show no sign of fusion when heated to the following temperature:

"Silica" material—not less than Seger cone 32; about 1710° C. (3110° Fahr.).

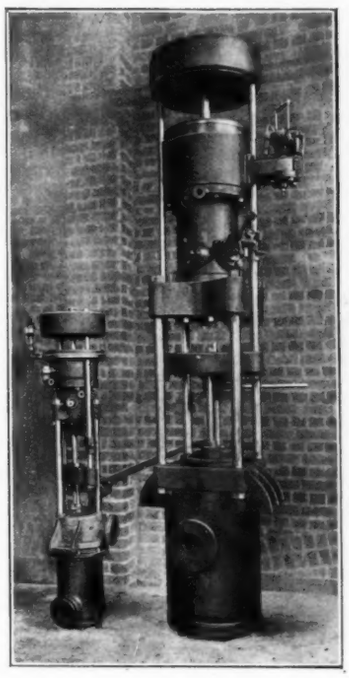
"Silicious" material—not less than Seger cone 29; about 1650° C. (3002° Fahr.).

One of the effects of the war has been the curtailing considerably of the rush of inventors to the Patent Office. Last year only 18,191 applications for patents were received—6629 less than in 1914, and the lowest number received in any year since 1887. The number of documents relating to foreign patents, designs, and trade marks deposited for record fell from 815 to 268. There were 93 notifications in respect of Germany, Austria 51, Hungary 9, Turkey 14, France 14, Russia 3, and Italy 2.

THE HUMPHREY PUMP.

Solid Piston Type.

Gas and water engineers alike will be interested in the new internal combustion pump brought out by the Humphrey Pump Company, Limited. The accompanying illustration shows the two sizes so far offered; and as the pumps are quite self-contained, it will be gathered that any idea that Humphrey pumps are only applicable in large sizes must now be reconsidered. The smaller of the two pumps will deliver quantities of water varying between 600 and 6000 gallons per hour, according to the head required—that is, with heads from 170 feet down to (say) 12 feet. The larger pump has about five times this output; and pumps for heads varying from 12 feet to 500 feet are listed.



The upper part of the pump forms a two-stroke cycle gas-engine cylinder, in which the piston is single-acting. The mixture is fired beneath the piston, which, in rising, raises the cheese-shaped weight at the top, the lower crosshead linked to it, and finally the bucket rod and bucket of a single-acting pump constituting the lower part of the combination. All work is done on the upstroke; and the energy given out by the linked weights falling again is all available for the compression of the new charge.

The dissimilarity in outward appearance between this and the water-column type of Humphrey pump familiar to engineers, makes it the more interesting to trace the hereditary features which they have in common. Both, for example, are true "free piston" engines; and the deliberate introduction of "mass" in the parts acted upon by the explosion of the mixture, forms the basis of both types. It is in this way that the velocities of the parts are kept within practicable bounds. The makers claim, nevertheless, that the pumps, being quite self-contained, are light in weight for their output; and having a purely reciprocating movement of parts, the maximum efficiency with the minimum of wear is obtained.

We hope shortly to return to the subject with a description of an actual installation of these pumps; and we feel sure that many readers will welcome a new and direct method of applying gas fuel to pumping work, promising many advantages over a combination of engine and driven pump.

Price of Coal for France.—A deputation of coalowners of the United Kingdom met Mr. Runciman, the President of the Board of Trade, on the 18th inst., at his request, to discuss a proposal for the limitation of the price of coal exported to France. A scheme has since been arranged, to come into operation on the 1st prox.

Waverley Gas Managers Association.—The centenary meeting of the Association will be held (under the presidency of Mr. John C. M'Millan, of Lasswade) in the Cockburn Hotel, Edinburgh, on Friday morning, the 9th prox. There will be an address, open to discussion, by the President; and a lecture by Professor Thomas Gray, of the Royal Technical College, Glasgow, on the "Bye-Products of the Gas Industry, with Special Reference to Coal Tar." After the business, the members will dine together.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

An Ordinary General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham —the PRESIDENT (Mr. C. H. Webb, M.Sc., of Stourbridge) in the chair. This meeting was, in view of the war, held in lieu of the usual May excursion.

MINUTES.

The HON. SECRETARY (Mr. W. G. S. Cranmer, of Willenhall) read the minutes of the last meeting; and they were confirmed. He also mentioned the receipt of several letters of apology for non-attendance.

LOSSES OF MEMBERS.

The PRESIDENT said that, since the last meeting, the Association had lost by death two of their members—Lieut. C. V. Townsend, of Hereford, and Mr. G. A. Collins, of Dudley. It would be remembered that at the meeting in March, reference was made to the illness of Mr. Collins. The hope was expressed that he would soon recover; and the Hon. Secretary sent him a message to this effect. Unfortunately, it had turned out otherwise. Also since their last meeting, Lieut. Townsend had been killed. As it was some little time before this meeting would come on, the Hon. Secretary acted for them in both cases, and sent a suitable letter, expressing what he felt sure would be the feeling of all the members. In both cases, he had had acknowledgments—from Lieut. Townsend's father, and from the relatives of Mr. Collins. In these two cases, there was therefore nothing further to be done; for he was sure the members would have no hesitation in confirming the action of their Hon. Secretary.

THE LATE SIR CORBET WOODALL.

The PRESIDENT (proceeding) said that more recently—in fact, only a few days ago—there had been a still further loss, not to the Association as such (for Sir Corbet Woodall was not a member), but to the whole gas industry; and it was a loss that should have some tangible expression at their meeting. He would ask Mr. Bell to move a resolution.

Mr. J. FERGUSON BELL (Derby) said he should first of all like to express his deep sympathy with the relatives of Lieut. Townsend and of Mr. Collins. Lieut. Townsend was a young man of great promise; and he had given his life to his country. They all sincerely regretted his decease, and tendered their heartfelt sympathy to his esteemed father, with whom many of them were well acquainted. Mr. Collins was an old member of the Association. He did not take much part in the debates of the Association; but he was a regular attendant, and a much-esteemed member. They all regretted his loss. As to the death of Sir Corbet Woodall, the whole gas industry deeply deplored his loss. Since the death of the late Sir George Livesey, Sir Corbet had been the leader of the industry. For a long period, he had taken a prominent part in all that concerned its welfare; and in recent years, there had been no question of importance brought before the industry in which Sir Corbet had not taken a leading part. He (Mr. Bell) thought that the success—the remarkable success—that had attended the immense Gas Light and Coke Company under the late Governor abundantly demonstrated that he was a great administrator; and not only so, but he had the faculty of being able to impress upon others his great individuality and strength of character. Distinguished as Sir Corbet Woodall was for his abilities as a consulting engineer and adviser to, and as an administrator of, a large number of companies, there were other characteristics which any of them could call to mind. He was esteemed for his charming personal qualities which, he ventured to say, had endeared him with an affection, loyalty, and respect, from the highest to the lowest in the industry. It was his (Mr. Bell's) privilege to know Sir Corbet, and to have been associated with him in certain affairs affecting the industry; and he could say that all matters that were brought to his notice were treated by him with a consideration and sympathy which were most encouraging. His great and ripe experience and influence were always at the command of the industry. To him they owed to some extent the introduction by the Government of the "Price of Coal (Limitation) Act," which had been abused in some quarters, but which they as a gas industry had much to be grateful for, because, had it not been for this beneficent measure, a lot of them would have had to pay higher prices for coal than they were doing. Sir Corbet was always in sympathy with his workmen. This was shown by the way he introduced profit-sharing in the Gas Light and Coke Company. Those engineers and officials who were under his administration, always spoke of him in the highest terms of affection, loyalty, and respect. He only expressed the feelings of the whole of the members of the Midland Association, and indeed of the gas industry at large, when he said they deeply deplored his death, and tendered to Lady Woodall and the other members of the family their heartfelt sympathy. In such terms his motion was made.

Mr. H. E. COPP (Etruria) thought he might lay some claim to second the motion so ably proposed by Mr. Bell, in that he had had the privilege of being associated with Sir Corbet for some time past, and he thought he might say in all modesty that he had enjoyed his good will for a number of years. He had known Sir Corbet for the last fourteen or fifteen years; and he had been closely associated with him during the past two or three years. His death came to him as a great shock, because he had been able to observe, since he had been closely associated with him, the wonderful qualities with which he was endowed. He was a man who possessed an infinite affection for the gas industry, and for those who were prominently responsible for the success of the industry. Further than this, he had the deepest regard in his heart for all the employees of the undertakings with which he was associated, and, indeed, with all employees serving the industry at large. He felt certain the industry had lost one whom it would be difficult to replace, as he always seemed to anticipate the wants of the industry, and was always willing and anxious to further its interests.

The motion was endorsed by the members silently rising.

NEW MEMBERS.

On the motion of Mr. H. ADAMS (Bilston), seconded by Mr. F. J. WARD (Knowle), Mr. Joseph W. Buxton, of the Handsworth and Woodhouse Gas-Works, and Mr. E. W. Smith, of Birmingham, were elected members.

TOLUOL AND THE LIMESTONE PROCESS.

There was next a discussion on the paper prepared, for the meeting last March, by Mr. GEORGE STEVENSON, of Long Eaton, on the above subject. The report will be found on pp. 452-4.

THE UTILIZATION OF PITCH.

The proceedings concluded by an informal discussion on this subject. The report also appears in this issue. [See p. 458].

Tempering and Annealing by Gas.

Particulars are given in the "Journal des Usines à Gaz" for May 5 of a gas-furnace recently installed by M. Mortagne, a manufacturer of springs in Paris. The furnace is heated by gas at the ordinary pressure; combustion being obtained with compressed air. Heat is supplied by sixteen burners, applied to the two side walls—eight to each. The consumption of gas varies from 12 to 15 cubic metres. Prior to the installation of this furnace, the tempering and annealing were done with coke as fuel, at a cost of about 20 frs. per thousand kilogrammes of springs. With the gas-furnace, the cost ranges from 22 to 24 frs., but the gaseous fuel nevertheless is found to effect great economy as compared with coke at its pre-war price. This arises from several causes, chief among which perhaps is the extremely regular and rapid treatment by the gas furnace—eliminating waste from burning or faulty heating of the springs. And this result is obtained without the incessant supervision necessary in the use of the coke-furnace, which, even when it receives the constant undivided attention of a workman, is a source of wasted material. Gas is also found superior to coke as fuel in the rapidity with which the furnace is got into full working operation—three quarters of an hour, as against three hours. Moreover the general hygienic conditions of the workshops are greatly improved, and manual labour reduced, from the fact that the workmen requires to give the furnace only occasional attention, and can undertake other duties. Our contemporary has gathered these facts from M. Mortagne, by whom, it is stated, three further annealing gas-furnaces of French make are being installed.

Benzol Recovery in Italy.

By an order of the Italian Government the washing of all coal gas for the recovery of benzol is made compulsory. Works producing more than 1,000,000 cubic metres are required to instal the necessary plant at their own expense; those producing less receive a grant at the rate of 10 frs. per 10,000 cubic metres. In general, and unless otherwise ordered by the Ministry of Munitions, the quantity of oil (benzene, toluene, xylene) to be extracted is limited to 15 to 20 grammes per cubic metre or to such quantity as will not reduce the calorific value of the gas below 4600 calories per cubic metre or its lighting power to less than two-thirds that fixed by any contracts. The benzol is to be of 55 per cent., with a margin of 10 per cent., but payment is made by reference to the quantity of benzol which distils at a temperature of 122° C., with a reduction if the percentage falls below this standard and a proportional increase if it exceeds it. Works which produce too little oil to do their own distillation will have this part of the process carried out for them by other establishments. One-third of the capital necessary for new plant may be advanced by the Ministry of Munitions—to be repaid in oil. The price to be paid for the oil varies, and is based on the cost of installation. It is subject to readjustment every three months, in accordance with the current price of coal. A sinking fund is created for a period of five years where the works continue the extraction of benzol after the war. Every works distilling coal, whether for the production of gas or for any other purposes, is required to declare the quantity of tar produced; and no distillation of tar is permitted except under the control of the authorities.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Newport.

AFTER an absence of some years, the Institution last Wednesday once more found themselves the guests of the Chairman and Directors of the Newport (Mon.) Gas Company. If no mistake be made, this is the third occasion on which the members have held a meeting in the town; but this fact seemed to increase (if that were possible) rather than diminish the warmth of the welcome which they received. Genial hosts, a programme which proved interesting to the members, and the Institution's usual bright weather, combined to make the meeting all that the visitors could wish.

The business proceedings took place in the offices of the Newport Gas Company; the members being welcomed by Mr. Thomas Canning (Engineer and Director), Mr. J. H. Canning (Manager), and Mr. T. H. Hazell (Secretary). In the unavoidable absence of Mr. A. W. Branson, of West Hartlepool (the retiring President), the chair was occupied by Mr. J. E. KENSHOLE, of Merthyr Tydfil, who was during the meeting elected President for the ensuing year.

MINUTES OF THE LAST MEETING.—APOLOGIES.

The HON. SECRETARY (Mr. Octavius Thomas, of Pentre) read the minutes of the last general meeting; and they were confirmed. He announced the receipt of apologies for absence, and wishes for a good meeting, among others, from Mr. Branson, Mr. George Clarry, of Cardiff, Mr. John Young, of Hull (President of the Institution of Gas Engineers), and Mr. John Bond, of Southport.

NEW MEMBER.

On the proposition of Mr. J. H. JONES (Dowlais), seconded by Mr. G. MAYNE (Penrhiwceiber), Mr. Albert Rosser (Merthyr Vale) was elected a member.

ANNUAL REPORT AND ACCOUNTS.

The HON. SECRETARY then read the eleventh annual report of the Council, which stated that during the year three members had joined the Institution, and three had resigned—leaving the number at the end of the year 68 members and two students. The receipts for the year amounted to £31 15s. 6d., and the payments to £31 12s. 8d., leaving, with the balance of £35 13s. 11d. brought forward from the previous year, the sum of £35 16s. 9d. in the hands of the Treasurer. Mr. H. D. Hazell, of Newport, Mr. D. J. Branson, of Kettering, Mr. E. H. Clarry, of Cardiff, Mr. G. S. Davies, of Risca (members), and Mr. H. G. Horwood, of Caerphilly (student), had joined the Colours; and the Council had exempted them from payment of their subscriptions for the period of the war. A copy of the "Reports of District Associations for 1915" had been sent to all the members who had paid their subscriptions.

The report and accounts were adopted, on the motion of Mr. F. ROBINSON (Brecon), seconded by Mr. A. T. KYLE (Abergavenny).

THE NEW PRESIDENT.

Mr. J. H. CANNING, in proposing the election of Mr. Kenshole as President for the ensuing year, remarked on the great interest which that gentleman had right from the beginning taken in the affairs of the Institution, on the Council of which he had for a long time sat. No one was better qualified than he to fill the position of President.

Mr. R. A. BROWNING (Neath) seconded the proposition, which was heartily agreed to.

The new PRESIDENT (who was warmly greeted on rising), returning thanks for his election, said that he would do his best to maintain the work of the Institution at the high level attained by his predecessors in office.

OTHER OFFICE-BEARERS.

Other office-bearers for the year were then elected as follows:

Junior Vice-President.—Mr. John Mogford (Briton Ferry).
New Members of Council.—Mr. J. H. Canning (Newport) and Mr. J. Robb (Chepstow). Mr. Robb was re-elected, as he had only served part time.
Hon. Treasurer.—Mr. Henry Morley (Teignmouth).
Hon. Secretary.—Mr. Octavius Thomas (Pentre).
Hon. Auditors.—Mr. J. A. Boucher (Maesteg), and Mr. G. S. Davies (Risca).

INSTITUTION BENEVOLENT FUND.

The PRESIDENT announced that the Council recommended that an additional amount of £2 2s. should be subscribed for this year to the Benevolent Fund of the Institution of Gas Engineers. It was not meant to increase the annual subscription (which had in the past been £2 2s.) by this amount; but they proposed an increased donation on this occasion, because the fund was very low, and last year the expenses were £60 more than the receipts. He understood that the Institution of Gas Engineers were sending out a circular asking for subscriptions, so as to try and wipe out this deficit; and the Council therefore wished to render what assistance they could. He proposed that the recommendation be adopted.

Mr. W. V. WATSON (Ebbw Vale) seconded the motion, which was agreed to.

THE DAY'S PROGRAMME.

Mr. HAZELL then stated the arrangements which had been made for the comfort of the members, and expressed the hope that the day would prove a thoroughly enjoyable one.

THE LATE SIR CORBET WOODALL.

The PRESIDENT said that before they proceeded to the technical business of the meeting, he had a very sad duty to perform. They would all know what this was. He rose to move a vote of condolence with Lady Woodall and the family in the great bereavement they had sustained. To the gas industry, Sir Corbet Woodall's death was a terrible loss. He had been its acknowledged head for many years; and whenever there had been a difficulty to solve, they had looked to him to solve it. He had always been ready to hold out a helping hand; and the loss of him would be felt for very many years to come.

Mr. THOMAS CANNING remarked that, having had the honour of the acquaintance—he might even say the friendship—of the late Sir Corbet Woodall ever since the year 1878, he rose with sad feelings indeed to second the melancholy proposition which the President had placed before them. Sir Corbet was all to their profession that Mr. Kenshole had stated. So far as the gas industry was concerned, he was undoubtedly a great man. In the other relations of life in which he (the speaker) had known him, he was bound to say that he was a good man. Anyone who had seen him in that most difficult position of all—giving evidence in the Parliamentary Committee Rooms, and giving it with that courage and very great regard for truth which he always maintained in the witness-chair—would unquestionably endorse the assertion that he was a good man. Thus not only did his reputation gain, but his authority also, until it became undisputed, and it was almost sufficient for a Committee to hear him to decide in favour of the views which he advocated. He was, too, a kind man, while at the same time a severe disciplinarian. Having been associated with him in some of the work he undertook in the country, he knew that he was a strict man; but he was profoundly kind. He was great, and good, and kind; and better words than these could not be said of any man. It was with a feeling of great sadness, because it was saying farewell to an old friend, that he seconded the proposal.

The vote was passed by the members rising silently in their places.

Tar Products: Their Past and Future.

Mr. J. HERBERT CANNING, F.C.S., then read a paper on tar products, which will be found, with a report of the discussion, on pp. 455-8. Before doing so, however, he pointed out that, ever since the war commenced, his father had taken a very great interest in the subject with which the paper dealt, and had, as a matter of fact, agreed to himself give them that day a paper on the question. Numerous other engagements and pressure of business generally had, however, prevented him from writing it. Under these circumstances, Mr. Thomas Canning had asked him, with the permission of the Secretary, to give them this paper instead.

The "C" Process—And Oil Washing.

Mr. H. D. MADDEN (Cardiff) opened an informal discussion on the "C" process, in which a number of the members took part.

The PRESIDENT said they were fortunate enough to have with them a gentleman of whom they had all heard. Mr. W. Doig Gibb, in addition to being President of the Southern District Association of Gas Engineers, was connected with what was now a very important branch of the Government; and they would all appreciate very much some words from him.

Mr. DOIG GIBB remarked that he would like to say a few words with reference to the position which existed at the present time. During the war, the conditions had been continually altering. At first, attention was devoted entirely to toluol; there being then no great demand for benzol. Subsequently, however, a great request arose for benzol—principally from the French; and it became important to get as much benzol as possible, in conjunction with the toluol. In short, they were now out to secure both. Probably, indeed, for the moment the slightly more important factor was the benzol. Tar-washing was the first process to be started; and there were certain conditions underlying it which made it more or less effective according to circumstances. They could not, of course, unfortunately, convert their Welsh gas coal into the best Yorkshire. It was necessary to take the coal as they found it; and the results varied accordingly. There seemed, however, to be no reason to doubt that the best results were obtained if the gas and tar could be handled at a temperature not exceeding 60°. Above this temperature the best results were not

achieved in respect to what was the most important consideration at the present time—the lighter oils. Of course, this was serious, because in the summer it was difficult to keep the gas and the tar down to 60°. But, as he had said, the nearer they could get to this, the better it would be. No one should be too much discouraged at finding a neighbour was doing better than he was. They were all out to do what they could with the apparatus at command; and the widely varying conditions between one works and another, made it rather unfair to compare results too critically. If each of them was doing what he could, no man was doing more, even if his results were better. In his paper, Mr. Canning advocated a greater extraction of benzol. He (Mr. Gibb) would not take up much of the time of the meeting on this point, because it had been ventilated in the papers more than once. But it would appear to every man that the future of the benzol market for many years should be exceedingly favourable. It was not possible to conceive that within the next ten or twelve years benzol would be at anything like the price it was in pre-war times; and, this being so, he thought it was fitting that they should consider—if they were going to do their best to back up Mr. Canning in his appeal—whether in many cases they could not wash the gas with oil, instead of, or in addition to, washing with tar. Certain considerations, of course, immediately arose. The first was that it was not possible to wash with oil if the oil had to be sent away to the tar distillers, debenzolized, and sent back. If they got a saturation in the oil of something like 4 per cent., they would be doing exceedingly well; and this meant that 96 per cent. of the oil they were washing with would have to be taken from the works to the tar distillers, and brought back to the works. It was a very simple thing indeed to put up a small distilling plant, with which they could use the oil over and over again, forming a complete sequence by washing the gas with it, heating it, condensing the benzol and toluol vapours, running off the hot oil and cooling it, and when cold washing the gas again with it. This did not cost much money; and there was no reason to doubt that it would prove a very profitable outlay. He was convinced that, while helping their country, they would also be helping themselves. But he placed patriotism first, when asking them to see if they could not take a little more out of their gas. The Ministry of Munitions did not in any way despise tar-washing. Everyone using tar-washing was doing very useful work for the country. What he did urge was that some of them might be able to go a little further, and consider oil-washing. Those who did wish to consider it, could have every information placed at their disposal by Mr. Canning, or by writing to the department. The authorities wanted more benzol; and oil-washing did increase the amount substantially. He felt that he could not sit down without thanking Mr. Canning, and the engineers assisting him, for the excellent work they had been doing to help the department, and also all those who were carrying on tar-washing, or doing anything else to assist. After coming among them as an invited guest, he feared he had become a beggar, in asking them, where possible, to put forth further efforts. Having said what he had, he would like to tell them that the present position with regard to high explosives was more satisfactory than was the case some time ago; but there was still the need of every possible effort on everybody's part to do as much as possible.

Place of Next Meeting.

The Hon. Secretary said the Council recommended that the next meeting should be held at Aberdare.

This was agreed to.

Thanks to the Gas Company.

Mr. A. J. Ward (Cardiff) said the pleasant duty had fallen to him of moving a vote of thanks to the Chairman and Directors of the Newport Gas Company for their great kindness and hospitality. The Institution had met on several occasions at Newport, and had always been received with the greatest cordiality by the Company. The members appreciated very highly indeed all that was done for them.

Mr. A. J. Bond (Aberavon), in seconding, said that right from the beginning the Company had been kindly disposed towards the Institution.

The vote having been heartily carried,

Mr. Thomas Canning remarked that he would convey it to the Board of Directors. He assured the members that they were delighted to be able to offer them hospitality; and, had he been able to come, nothing would have given the Chairman greater pleasure than to be present. Mr. Hazell would, he knew, leave no stone unturned to do all that one man could to make everything as comfortable as possible for them.

Luncheon.

The members then proceeded to the Westgate Hotel, where they were the guests of the Chairman and Directors of the Gas Company at luncheon. Mr. G. Green, J.P. (a member of the Board), presided; and he was supported by Mr. A. H. Laybourne and Mr. Thomas Canning, J.P. (also Directors).

After the honouring of the Loyal Toast,

Mr. Madden proposed "The Chairman and Directors of the Newport Gas Company," coupling with the toast the name of Mr. Geen. He said the Institution owed practically its origin to the support accorded to it in its early stages by one of the present Directors—Mr. Thomas Canning. It also owed much to the Gas Company, who had done everything possible to make the meetings at Newport a success. Consequent upon the encouragement thus received, the Institution had thrived. They would never forget, too, the happy auspices under which they met at Newport for the British Commercial Gas Association conference, and the strong bond of fellowship which it seemed to promote throughout South Wales. They all heartily wished that the Chairman (Dr. Brewer) might be restored to better health.

Mr. Geen, responding, explained that he was occupying the chair in the enforced absence of Dr. Brewer and the Vice-Chairman. On behalf of the Directors, he extended to the Institution a very hearty welcome to Newport. Such gatherings as these were excellent. He trusted and believed that at the Crindau works they would see some improvements. If there were any defects to be found—of which he had his doubts—he was sure Mr. Canning and his son would be only too pleased to have them pointed out. Under the able guidance of these two gentlemen, and as a result no doubt to some extent of these meetings, the Company had done all they could to increase the consumption of gas for all the purposes for which it could be used. They had competitors now; and therefore it behoved all the busy brains of the gas industry to meet together, in order to uphold their position in the world of lighting, heating, and cooking. He hoped the members would have a pleasant afternoon, and derive some benefit from their visit to the works.

Mr. Doig Gibb proposed "The Wales and Monmouthshire District Institution of Gas Engineers and Managers," and remarked that there was no doubt these District Associations did excellent work—not so much, perhaps, at the meetings, as during the informal talks. It required a very brave man, for instance, to read a paper in public confessing a failure; but he could relate his experiences privately without the same hesitation. It had given him very great pleasure to meet the members.

The President (Mr. Kenshole) said he distinctly remembered when it was proposed to form the Institution. Two or three friends when they were spoken to were of opinion that it would not do much good; but he felt it would be a great benefit to have such a body in South Wales. Circumstances there were totally different from what was the case elsewhere. The longer the Institution went on, the stronger it was getting. They had better papers; and they were becoming more brotherly. This was a most important thing. If a man wanted advice, he knew he could get it.

Mr. Browning proposed the health of "The Chairman," and said their hearty thanks were due to Mr. Geen for presiding at the lunch. He reminded those present that Newport provided the first President of the Institution—Mr. Thomas Canning. When the Institution was first mooted, he (Mr. Browning) was one of those who doubted whether there was anything in the idea. He made a mistake, and was very pleased to acknowledge that it was a mistake.

Mr. Geen, in reply, assured the members that the Directors would look forward to having the Association as their guests again on some future occasion.

At the Gas-Works.

Rising from the tables, the visitors found a private tramcar waiting for them outside the hotel; and on this they proceeded to the Crindau Gas-Works, on the outskirts of the town. Here, under the guidance of Mr. Thomas Canning and Mr. J. H. Canning (the Manager and Resident Engineer), they found much to interest them.

The whole of the gas required for the supply of Newport is now manufactured at these works; the Mill Street works being employed only as a storage and high-pressure distribution station. The Crindau works were designed by Mr. Thomas Canning, and opened in 1885; and one of the features is the ample room which exists for further extensions, as required. Another feature is the cleanliness and orderliness everywhere observable, and the completeness of the arrangements for the welfare of the employees. The works are in two ranges of substantial buildings, situated on either side of a wide road leading to the coke-yards at the lower end.

Since the last visit of the Institution, six years ago, the carbonizing plant has been extended by some 50 per cent., and now consists of eighteen benches of nine 18-feet retorts, the entire carbonizing plant having a capacity of 2,625,000 cubic feet daily. The drawing and charging operations are performed by means of Fiddes-Aldridge stoking machines. Eight-hour charges are the practice; the coal put into each retort being about 9 cwt., so that the Fiddes-Aldridge machine at each operation deals with some 15½ cwt. of material—9 cwt. of coal and 6½ cwt. of coke.

The sidings from the Great Western Railway stand about 25 feet above the general level, which enables the coal to be tipped direct from the trucks either into the breaker-hopper or any portion of the store. These sidings have been recently considerably extended, so as to deal with the increased traffic; and further facilities have also been provided for the rapid loading and unloading of oxide, fire-clay material, castings, &c. Coal, after passing through the crusher, is elevated to the top of the retort-house, and distributed by an endless push-plate conveyor to hoppers running the length of the house, and fitted with Aldridge-Gibson patent doors for supplying the stoking-machine beneath. The retorts are heated by Winstanley regenerative furnaces.

The coke is removed from the retort-house by an electric telpher, dipped into a water-tank, and carried to the heap in the yard. The telpher-track is continued over the railway siding at a high level, for loading coke into waggons. In addition to this, the telpher is used for all traffic to and from the railway sidings, including the loading-up of dehydrated tar in barrels into trucks. Facilities are also provided for loading tank-waggons, by means of a pump, with tar and light oils.

A "Cyclone" tar-separator, and a "Kirkham" centrifugal washer-scrubber, have recently been erected; and the latter is now being employed for the extraction of benzene and toluene for the Ministry of Munitions. Opposite the exhauster-house is a power-house, where electricity is generated by means of gas-

engines. The power-station contains four gas-driven direct-coupled generating sets of a total capacity of 125 KW.; the latest addition to this plant being a 50 KW. set driven by a twin-cylinder gas-engine of the latest type. This set is very economical in working, and takes up the bulk of the heavy load.

The Newport (Mon.) Gas Company were probably the first undertaking in South Wales and the West of England to realize the advantages of tar dehydration; and they installed some years ago a Wilton tar-dehydration plant. It has been found necessary to duplicate this plant, in order to cope with the very heavy demand during the summer months; while overhead storage tanks have been provided for the dehydrated tar, together with every facility for loading same into road-waggons, barrels, or tank-waggons on the sidings. Considerable extensions have also been made with a view of meeting the requirements of the High Explosives Department—special storage having been provided for the light oils manufactured, so as to prevent the loss of the more valuable volatile constituents.

There are two purifying-houses; and in one of these the purifiers are fitted with Ramsden-Smith patent valves, and covers of the Green type. A new building adjoining the meter-house contains a boosting plant electrically driven, which has been found necessary to cope with the rapidly increasing demand for gas. This plant is in duplicate, fitted with a water-loaded outlet governor; while provision has been made, by means of an automatic bye-pass valve, for maintaining the supply of gas in case of a stoppage or failure of the plant. There is a water-gas plant of the Economical Gas Apparatus Construction Company's type; and for this separate apparatus is provided right up to the holder, where the water gas is mixed with the coal gas.

In view of the very extensive adoption of machinery at these works of late years, the Company have recently added a new block of buildings containing an up-to-date mechanical fitting shop, blacksmiths' and carpenters' shops, and a spacious dining-room for the workmen. It may here be mentioned that the Directors of the Company placed the Crindau fitting-shop at the disposal of the Ministry of Munitions for the purpose of training munition workers. A considerable number of men have been trained; and at the present time very successful classes are being held for women munition workers. The authorities have expressed their entire satisfaction with the facilities and the training which the patriotic action of the Directors of the Company has placed at their disposal.

Near the gate of the works there has been erected an office and laboratory; the latter taking the place of the Company's old laboratory at Mill Street, which was unfortunately destroyed by fire a few years ago. Though the fire in question ruined much valuable apparatus and many irreplaceable objects and products connected with gas-works (the collection of many years), the new premises are a distinct gain in convenience as compared with the old.

Leaving the gas-works, the members returned by the tramcar to the town; and tea at the Savoy Hotel, as guests of the Company, brought a successful meeting to a close.

COKE-OVEN MANAGERS' ASSOCIATION.

The members of the Coke-Oven Managers' Association, on Saturday afternoon, visited the coking and bye-product plant at the Waleswood Colliery, South Yorkshire, at the invitation of Messrs. Skinner and Holford, Limited (the owners), and Mr. T. P. Carr (the Coking Manager). The party were greatly impressed by the good order and cleanliness of the plant. The Colliery Company had provided two motor buses for the conveyance of the visitors to the works from the gathering centres at Rotherham and Killamarsh. Mr. Carr and Mr. C. Shinn acted as guides.

The workings, as shown in the tour of inspection, are based upon a battery of thirty regenerative ovens built by the Simon-Carvès Company, of Manchester, working coal entirely from the Waleswood pits. The coal is of an exceptionally salty nature; and the injury thereby caused to the brickwork involves a good deal of repair and renewals to the oven interiors, despite the fact that a considerable percentage of the salt is eliminated in the washing process. In the office of the laboratory, the visitors were able to examine a number of specimens of salt-damaged brick; and these were of great interest, more particularly in view of the valuable lecture on the subject which was given at the recent Leeds meeting of the Association, by Professor J. W. Cobb, of Leeds University.

The coal is treated in a Baum washery, of a capacity of 40 tons per hour. The plant recovers tar, ammonia, benzol, and naphthalene. On the ovens two shifts per 24 hours only are worked; each shift being of eight hours, with two four-hour intervals, during which no ovens fall due to be pushed. The arrangement is successfully managed to avoid loss of gas. The ovens are charged by a Buchanan combined stamper, charger, and ram. On the coking-bench side, there is no stationary sloping bench; the coke being discharged on to a travelling coke-car, which serves all parts of the battery. The quenching is completed on the car; and the coke is then carried to a screening station and deposited directly into railway waggons—provision being made for the small coke to drop through when necessary. About half the gas secured from the carbonizing is used in the ovens, and the other half is transferred to the colliery for their four boilers. All the equipment on the bye-product plant is electrically driven, the current for which is generated at the colliery. The pitch recovered is broken up, oil added, and turned into saleable tar. The coke breeze is also mixed with tar and sent away for use in firing the Company's colliery boilers. The surplus gas amounts to about a million cubic feet per day.

After the inspection, the party were entertained to tea in the Miners' Institute.

Mr. WM. DIAMOND (Marley Hill, Durham) proposed a hearty vote of thanks to the Colliery Company and to Mr. Carr for their hospitality. The most striking feature about the plant, he thought, was its cleanliness and tidiness throughout. He believed it was intended to reconstitute the Association to some extent, and to establish branches for the widely separated areas; and he could assure the members that those in the distant parts would be glad of this change. When an opportunity offered, he felt sure that both Mr. Philipson, who had come down from Durham with him, and himself and their Directors would be glad to welcome the Association to their plants in the county of Durham.

Mr. G. A. PHILIPSON (Littleburn, Durham), in seconding, expressed the opinion that the Waleswood plant was an example to most places. A gibe had been rather often poked at the British coking industry, to the effect that German plants were kept particularly clean; but he might say with confidence that, having visited several German plants, he had never found one cleaner than Mr. Carr's. Coking managers, of course, were often handicapped in this respect by the fact that their directors thought a good deal more about profit and loss than about the cleanliness of the plant; but it ought to be fully realized, and was realized by managers, that cleanliness and tidiness made for greater efficiency.

The resolution was carried unanimously; and Mr. CARR responded.

The New Constitution.

At the business meeting which followed in the Institute, the PRESIDENT (Mr. George Chrisp) presided.

The sole business of the evening was consideration of the motion, of which notice had been given by the Hon. Secretary (Mr. J. T. Price), "That the present system of control of the Association—that is, by a Council of five members, together with the President, Treasurer, and Secretary, together further with a co-opted member from each branch—be altered, and that the so-called parent body becomes a branch, and that a General Council be formed for the whole country, made up of representatives from the different areas, in proportion to the strength of the branches. This to take place at the annual meeting." Mr. Price said one of the most important reasons he made this motion was that the Association, at the present time, had grown out of all proportion to what had been originally anticipated. The present system had become unwieldy; and when they took into consideration the several nominations for membership which they had before the meeting, they had 122 members and associate members. It was getting out of bounds. His idea was that they should form eight branches—Cumberland and Scotland, Durham, Staffordshire, West Yorkshire, South Yorkshire, Derbyshire, Lancashire, and Wales. Possibly it might be more convenient to link South Yorkshire and Derbyshire together. His idea was that the South Yorkshire group—which had been formerly called the Midland Counties branch, and which seemed to have become the parent body—should become a branch like all the others, and that each branch should have its own Chairman, Vice-Chairman, Secretary, and Local Committee. Then they would constitute a national body or General Executive, to be made up of representatives from all branches in proportion to their strength of membership. He thought if they did not do something of the kind, the Association was going to die a natural death.

Mr. LANT seconded the motion, and said he thought that, while the Council had, so far, ruled very wisely and well, it should be much more representative.

Mr. W. DIAMOND, Mr. G. A. PHILIPSON, and Mr. E. M. MYERS also supported the motion.

Mr. B. W. HAIGH said he did not like to feel himself in opposition to the majority; but he certainly thought it was not wise to tamper with the constitution. Mr. Price had suggested that the Association would die a natural death if they did not change their constitution. Did the present membership of 122 in the first year of existence, out of a possible 150 or 160, look like dying a natural or any other death?

Mr. J. W. LEE (Chesterfield) said he was in the curious position of agreeing, to some extent, with both sides to the question. He would suggest another course; and he was prepared to move an amendment—"That it shall be an instruction to the Council that they, with representative members from every coking area, shall prepare a scheme for the formation of a National Council, and shall examine the constitution of the Association and suggest alterations with this end in view."

Mr. HAIGH seconded the amendment.

The PRESIDENT said it seemed there was very little between them. Unless the constitution was altered to the effect intended, the branch with the largest membership would automatically become the ruling body. They must have a scheme by which every branch should be proportionately representative. If the amendment were carried by the present meeting, the Council would proceed to draw up a scheme on the lines suggested.

The resolution was carried.

TOLUOL AND THE LIMESTONE PROCESS.

Trials and Criticisms.

For the meeting of the Midland Association held in March last, Mr. George Stevenson, of Long Eaton, prepared a paper on the above subject; but time did not permit of its discussion. It was, however, decided that it should be considered at a meeting to be held in May; and this took place on Thursday last at the Grand Hotel, Birmingham. As the President (Mr. C. H. Webb, M.Sc., of Stourbridge) explained, the paper was, after the last meeting, published in the Technical Press [see "JOURNAL" for March 28, p. 692]; but, nevertheless, he would ask Mr. Stevenson to review the paper, and add any particulars his subsequent experience and tests suggested as desirable.

Mr. STEVENSON said he did not want the members to think that he was laying claim to teach any of them anything about carbonizing. The only object of the limestone process was the increase in the recovered hydrocarbon contents of the gas and tar. In the paper, he gave a little historical record of the use of lime in general; and he was particularly sorry Mr. Paterson was not present, because he (Mr. Stevenson) felt that the success of using burnt or calcined lime was entirely due to the fact that at Cheltenham they overcame the difficulty of mixing. He should have liked Mr. Paterson's views on many points—particularly as to any increase he had obtained in the hydrocarbon contents of his gas or tar. The limestone process differed very much from the use of burnt lime; it was intended for coke-ovens with thirty-six hour charges, and in mass form. They had tried the process at Long Eaton, and had consistently had good results for nearly twelve months. He knew that many people had not had the same experience; but he could only speak of his own tests, and give one or two suggestions as to where difficulties might occur, and how they might be overcome. In the first place, the limestone system was particularly unsuitable for hand-charged retorts or for charges of short duration. It was of no use mixing the limestone with the coal in six or eight hour charges; and no use applying the process at all unless with small coal, because there was not sufficiently intimate contact with large lumps. The smaller the coal, the better the results obtained both with regard to gas and tar. This would be self-evident; and it was particularly brought out in Mr. Paterson's Southern Association paper in 1911. In his (Mr. Stevenson's) own paper, he said he did not necessarily subscribe to the theory of the limestone process, because, after all was said and done, it was a little bit dangerous to dogmatize as to the actions that took place in a closed retort. All along, he had said that "the proof of the pudding was in the eating;" and they must see what the results were. The difficulties of mixing the limestone were overcome in the simplest of manners. After spending a good bit of money in trying to get a regular mixture, they eventually found that, without machinery, it was possible to put lime on the waggons, and then let the coal be broken and be elevated into the coal-bunkers in the ordinary way. The physical condition of the limestone was of importance; and they were experimenting in this direction at the present time. [Mr. Stevenson exhibited samples of limestone dust.] Regarding one, he said it was a sample of limestone that they once used; and he had found out since that it was not really a pure mountain limestone, but was limestone dust blown by blasting. He understood that it should be pure mountain limestone—practically pure calcium carbonate. The other sample, he said, was ground from the pure limestone; and it did not contain the blown dust or other foreign material. The whole of the difference between this limestone process and Cooper's liming process lay in the fact that whereas the use of quicklime was suitable for all coals for purposes of increased ammonia and reduction of sulphur, the limestone was only suitable for low-grade coals, which were high in oxygen, and high in volatile matter. He had not yet found that the process was suitable with high-grade coals as it was for Derbyshire and Nottinghamshire coals. The objections urged against the process by the coke-oven people were principally two. First it was said that the coke was spoilt, because it was pitted by lime. This depended upon the percentage used. If a percentage based on the alumina and silica in the coal was used in definite ratio, there would be no effect on the lime, except a slight increased percentage of ash—about 2 per cent. This did not matter very much, because, even with this 2 per cent., the percentage of ash in his case was much less than that in the coke from neighbouring vertical retorts. So that, if they had less ash in the coke with this process than was present in vertical retort coke without the process, there was little to be feared on that account. The second point was as to whether the use of the limestone in coke-ovens would cause the calcium oxide to have a corrosive effect on the brickwork. At Long Eaton they had been watching the process very closely, and had so far found no such action. The percentage of limestone was very small. They were using about 2½ per cent. with twelve-hour charges, and plenty of time was given for the decomposition of limestone in the mass. In his opinion, only heavy charges and long duration carbonization would make this system a success. All along he had had consistently good results. There had been practical freedom from stopped pipes; the coke had certainly not been damaged in quality; and they had had slightly more gas per ton of coal. More important still was the real object of the process—viz., to see whether they could get more toluol into their tar. A lot of gas in the holder meant a small toluol yield. They had since using the process uniformly shown an increase of toluol and benzol; and, without either accepting or contesting the theory of this patented process, the fact remained that there was some action on the tar which altered its character. It was a thinner tar, and contained more light oils. There was another action—that of catalysis; but he would refer members who desired to pursue this further to Dr. Rudolf Lessing's "William Young" lecture in 1914, and to a little book on "Catalysis in Industrial Operations." There was no doubt that some action in the nature of catalysis did occur, which enabled these physical reactions to take place inside the retort. What these reactions were, he should not like to say. But there was the fact that the effect on the gas was that there was a slight increase in the quantity, as well as in the quality, of the gas. They were not actually taking tests for the lighting value; but the President pressed him to make tests. He said he would do so, and would give them whether they were for or against the process. With flat-flame burners, they did get better results; and the analysis of the gas bore out this statement. They had recording calorimeters going continuously; and standard tests were taken day and night. There was a very striking decrease in the sulphur in the gas. In the table in the paper [see "JOURNAL," March 28 last, p. 693], it would be noticed that the sulphur in the treated gas—the average of many tests—was 13·9 grains per 100 cubic feet. He wanted to emphasize this point, because he had only one 8-inch ascension-pipe; and 13 grains of sulphur was a most wonderful result.

Mr. J. FERGUSON BELL: What test did you use?

Mr. STEVENSON: The Referees' 24-hour test. With regard to the tar, there was a little alteration of the specific gravity; and on fractionation there was an increase in toluol and benzene. This after all was what they set out to get. When making tests in July of last year, they found that, when (for test purposes only) stripping the gas entirely with green oils, they had largely increased the toluene in the tar by means of the limestone process. During the week March 1 to 8, the temperature was very low—it was very bitter cold weather; and therefore the results with regard to both toluene and benzene were distinctly favourable to the unlimed coal. During the following week, when using limestone, they could not get down to the same temperatures; and yet there was an increase. They were continuing to use the limestone at Long Eaton, because they were obtaining good results. What other people were getting he had no means of knowing. He should like to say that he was not financially interested in the process in any way. In conclusion, he said that they must all admit that here they had a difficult problem; and that the many and varying changes and phases of carbonization, and the complexity of the tars, added to the difficulty or certainty of properly comparing the results of applying such a process at different gas-works. But further experience might establish some definite lines and practice which might lead to final and general success. The question of tar-washing and oil-washing was now much to the fore; but this process did not come into the same category—its object was to increase the quantity of toluol and benzol available. The question would be asked, Where did the increase really come from? There, again, he could not answer. He should imagine there was a very big decrease in the free carbon of the tar; and they must therefore take the whole results, both in gas and tar, before determining exactly where the increase came from. One manager recently wrote to him asking about his methods of condensation. His condensing arrangements were very efficient—in fact, he had three to four times more than was necessary.

The PRESIDENT said he really could not allow Mr. Stevenson to describe the paper as a "stop-gap." How the subject of the paper arose was that Mr. Stevenson, being the Special Secretary of the Association for toluol purposes, and he (the President) was what was described as a Visiting Engineer for a certain part of the district, they had had a number of conversations on toluol; and he told Mr. Stevenson before the last meeting that he (the President) wanted to have a discussion on toluol, because his feeling was that the object of an Association of this kind was the discussion of current matters of immediate importance to the industry. At his request, Mr. Stevenson consented to give the paper, and to make two weeks' tests—one with and the other without the limestone process—under the ordinary running of the works. What happened in regard to the postponement of the paper, the members were all aware. He took it that what they were all after was the truth. Mr. Stevenson did not suggest that this was an all-round process suitable for everybody. He simply stated that it was designed especially for low-grade semi-coking coals. Anyone using anything else need not expect the same results. They must also have mass-charging, which brought in the machine; and they must have long duration carbonization. A point that appealed to him (the President) was that, if there was even a little more difficulty in clinkering the furnaces, it was a serious point, because the labour of clinkering was already very heavy; and if, by inferior cleaning, the heats were affected, they would also indirectly suffer. The reduction in the sulphur contents was also an important thing. It was hard to value it in money; but as gas engineers, they knew what it meant to have a gas low in sulphur compounds. The increased yield in toluol was the point for which the paper was principally given. Practically, in the results presented in the paper, the process did not cost anything—that was to say, the cost was balanced by the extra results

per ton. There was no doubt as to the accuracy of the figures; and those who had studied the result would find them very important indeed.

Critics and Contrary Experiences.

Mr. J. Ferguson Bell (Derby), in his opening remarks, said he should like to thank Mr. Stevenson for his great courtesy to Mr. Berridge and himself when they visited Long Eaton to see the process in operation. He was very candid. They also met the patentee, and were shown all there was to be seen, and given all the information at their disposal. He (Mr. Bell) went away very optimistic as to the results to be achieved by the process. They made a trial at the Litchurch works, at which they carbonized while using the process something like 2000 tons of coal. The results were so disappointing that they had to discontinue it. They found the quantity of the gas was not increased; the illuminating power was practically the same; the sulphur in the gas was the same; the coke was depreciated; and they were getting trouble with the firemen owing to the fusion and difficulties of clinkering. The figures that Mr. Stevenson gave them were so startling that he thought it only fair they should make another test at their smaller works, which were in direct contact with their offices, and where they could get greater accuracy of results and supervision. He asked their Chief Chemist and Assistant Engineer to take up the matter; and he desired to express his indebtedness to them for the great trouble and attention they gave to the process. They started a week's trial, and carbonized with and without limestone 750 tons of coal, which was about double the quantity upon which Mr. Stevenson gave the results set out in the paper. The only difference was at the works in question they had nine-hour charging, while Mr. Stevenson had twelve-hour. The coal that Mr. Stevenson was using (this was when he joined issue with him) he called a low-grade Derbyshire coal. But he (Mr. Bell) asserted that it was not a low-grade coal, but a medium one. It could not be classified as a semi-coking low-grade coal. They found at Derby that the calorific value per ton of coal when using limestone, and without limestone, was practically the same—in each case 6½ million B.Th.U. Mr. Stevenson, in his paper, gave the number as 6,495,574 B.Th.U. with the limestone process; he (Mr. Bell), without limestone, was getting practically the same. They were using almost the same kind of coal, and under almost exactly the same conditions. Mr. Stevenson had a De Brouwer machine; he (Mr. Bell) had the same. The results were therefore quite comparable. The author did not give the illuminating power of his gas; but, calculating it out from its calorific value, he took it that it would be something like 13½ candles. The gas at Derby was about 14½ candles, and of a slightly higher calorific value. The illuminants given in the paper without limestone agreed with his own. With the limestone, they went up at Long Eaton to 5·9 per cent., against 3·8 per cent. without limestone. Well 5·9 per cent. was a remarkably high result—a much higher result than he (Mr. Bell) would anticipate with 14, 15, or 16 candle gas. He noticed also that Mr. Stevenson said the coke was improved, or not decreased in value. Well, at Derby the experience was that without limestone the ash in the coke was 8·5 per cent.; with limestone, 12·1 per cent. Of course, the ash would vary according to the coal. In both the analyses of the tar, Mr. Stevenson gave a greater volume. With regard to sulphur, Mr. Stevenson got down to a remarkably low point for Derbyshire coals—from 25 to 13·9 grains per 100 cubic feet. His (Mr. Bell's) own experience with Derbyshire coal, with one ascension-pipe, was nearer 40 grains per 100 cubic feet. At Derby, they used 2½ per cent. of limestone; he thought that Mr. Stevenson must have been using a little over 3 per cent.

Mr. Stevenson: 2·9 per cent.

Mr. Bell (continuing) said they mixed their limestone similarly to what Mr. Stevenson did; they put the 2½ per cent. in at the entrance to the breaker-pit. So he had no hesitation in saying that the limestone was very carefully mixed. He quite agreed with Mr. Stevenson that a great deal depended upon having the limestone intimately mixed with the coal. They had no complaints (in these times of pressure for fuel) with reference to the coke, although it did not look quite so well; but he was afraid if they used the limestone in normal times, they would have difficulty with the coke. Mr. Stevenson introduced the process with the most laudable object—that was, to increase the toluol content of his tar. His (Mr. Bell's) toluol content in the tar both with and without the limestone was practically the same; and he was sorry that in his analysis Mr. Stevenson did not give the total amount of the toluol and benzol in the gas, because, as he had pointed out, there was a difference of 10° in the washing, which affected the process. If Mr. Stevenson had told them the total amount of toluene and benzene in the gas with and without the process in operation, then they could have made better comparison. Of course, the washing results themselves were affected by the efficiency or otherwise of the washer. The balance-sheet that Mr. Stevenson gave showed the results of the process in detail. He took credit for 280 cubic feet of gas; but 100 cubic feet of this was carbonic acid. Instead of taking credit for 280 cubic feet of gas, he ought to deduct something for putting in the 100 cubic feet of carbonic acid. The candle power of the gas was reduced about half-a-candle. Then Mr. Stevenson said his gas was worth 18d. It might be as distributed; but, with the economical manner in which work was done at Long Eaton, the gas was worth only about 1s. in the holder. This made a considerable difference to the cost of the process; and so far as he (Mr. Bell) could see, it meant putting about 6d. per ton of coal on the working costs. Personally, he was not in the happy position that he could afford to put anything more on his costs. The coal people had taken so much out of him, that he must try to get down the costs, instead of putting something on. The results given by Mr. Stevenson as to his calorific value per ton of coal showed a variation of only 3 per cent. He (Mr. Bell) found his results from day to day, with the same class of coal and conditions of working, varied about 3 per cent.; so it was rather dangerous to make a claim for so small a difference. Reverting to the question of sulphur, he mentioned that, when using the process, he found a reduction of about 7 grains per 100 cubic feet—that was with limestone they got 34·5 grains per 100 cubic feet; without limestone, 41·3 grains. This was oxide purification. It was a very remarkable thing for Mr. Stevenson to get down below 20 grains with the class of coal he was using. He did not in any way dispute the figures that had been given. They merely showed how results would vary between one works and another. He was glad the process had been brought forward. The Cooper coal liming process was at one time going to do wonders. He did not know at how many works the latter was in operation at the present time; but (if any) he thought they could be counted on the fingers of one hand. So far as Derby was concerned, the limestone process had no attractions for them.

The President: What is the weight of the charges you have been referring to?

Mr. Bell: Practically 8 cwt., with 18 feet retorts, 21 in. by 15 in. Mr. Stevenson's retorts are 23 in. by 16 in. The complete results he would hand to the Press for publication. They are as follows:

Limestone Trial.

Cavendish Street Works of the Derby Gas Company.

[Coal used—Gas nuts from Pinxton, Pilsley, Clay Cross, Hardwick.]

	With Limestone. April 12 to 20.	Without Limestone. April 25 to May 2.
	Tons. Cwt.	Tons. Cwt.
Coal carbonized	470 15	432 16
Number of charges	1,226	1,088
Cwts. per nine-hour charge	7·68	7·95
Gas made, cubic feet	5,278,000	4,827,000
,, ,, per ton of coal	11,211	11,152
	B.Th.U.	B.Th.U.
Average calorific value (gross)	148·6 = 588·5	146·4 = 579 7
	B.Th.U.	B.Th.U.
,, ,, ,, per ton coal	6,597,673	6,464,814
,, illuminating power	14 80	14·21
Average composition of gas—	Per Cent.	Per Cent.
CO_2	3·34	2·75
Illuminants	3·74	3·34
O	0·81	0·82
CO	9·62	9·00
CH_4	32·24	31·19
H_2	42·80	44·80
N_2	7·47	8·10
	100·00	100·00
Sulphur, grains per 100 cub. ft.	34·5	41·3
Naphthalene ,,	2·4	3·0
Coke, per cent. ash	12·1	8·5
Tar made, gallons	4600	4250
,, per ton of coal	9·77	9·84
Analysis of tar—Sp. Gr.	1·144	1·150
Water	5·20	5·20
Naphtha 0 – 145°C.	3·40	3·08
,, 145 – 170°C.	1·54	1·04
Toluene per ton of coal in tar	0·93 lbs. } 4·54	0·71 lbs. } 4·71
,, ,, left in gas	3·61 ,, }	4·00 ,, }
Benzene per ton of coal in tar	1·37 ,, } 15·37	1·16 ,, } 16·49
,, ,, left in gas	14·00 ,, }	15·33 ,, }
Av. temperature of washing—		
Gas	54° Fahr.	58° Fahr.
Tar	56° Fahr.	60° Fahr.

Note.—The increase in naphthalene in the second case is due to warmer weather.

Mr. H. E. Copp (Etruria) said that he had tried the process on a larger tonnage of coal—some 14,000 to 15,000 tons, and over four winter months. He had no figures with him, but he found practically the same results as Mr. Bell—very little difference in the illuminating power, a considerable difficulty with the clinkering of the furnaces, and a substantial reduction of sulphur compounds. Their average was 32 grains per 100 cubic feet before the adoption of the process, and 21·8 grains after applying the process. This was a very distinct advantage; but Mr. Stevenson had told him that afternoon why they did not get the collateral advantages. That was, of course, that they were only able to use short duration charges, owing to the type of their stoking machinery. This undoubtedly was the key to the whole position. He could quite see from the patentee's theory that, if they used charges in bulk, an advantage would be realized. The theory was a very beautiful one, and a sound one—on paper, at any rate. When he started the process, he felt confident they would get improved results; but it was a question of time-contact.

Mr. Stevenson: Time and mass contact.

Mr. Copp (proceeding) said they found a slight increase in toluene and benzene; but the only definite advantage was a reduction of the sulphur compounds. The reason he discontinued the process was the fear of serious trouble with the men responsible for cleaning the fire-bars.

Mr. A. Dougall (Kidderminster) had also tried the process,

and said that, so far as toluene was concerned, they had no improvement, but rather less than before. The furnaces were also harder to clean. Where they had found an advantage was that they had practically no choked pipes since they started; and the tar had been thinner. The weights of charges were 11 cwt., and the retorts were 18 feet by 22 inches by 15 inches.

The PRESIDENT: Practically full?

Mr. DOUGALL: Yes. The coal was good North Wales and South Yorkshire.

Mr. W. S. MORLAND (Gloucester) had tried the process for over a month. In the first place, he had the views of the inventor, and thought he would act entirely on his instructions. He showed him their ordinary method of working at Gloucester. They charged with West's manual machinery; so that they could not fill the retorts. The inventor, however, assured him that the process would be a success; and so he (Mr. Morland) thought he would give it a fair trial. He ordered some ground limestone, and asked the inventor if he approved of it, and whether it would give the results that he claimed. The reply was that it would be all right; and he (Mr. Morland) then proceeded with his experiment. With six-hour charges and West's manual machines, the results were no better than before. The toluol content was not increased; if anything, they had trouble in keeping the heats up. Directly they got the limestone into the coke, it gave trouble; and the heats went back. So long as they were using the process, the heats went down; when he abandoned the process, the heats went up. He had a serious complaint from one of the largest coke users, who were doing a lot of work for the War Office. They complained that they had serious trouble in welding axles for military carts. They got one of their smiths to put the axles under test; and what looked like a good weld would not stand the test. He found the weld was perfectly sound outside; but near the centre, there was a circular space of about ¾ inch where there was no weld at all. He came to the conclusion that, if they were going to damage their coke trade, he would stop the process at once. The inventor saw him on the subject; and he then said the process was no good with shallow charges and short duration carbonization. The sulphur came down by about 2 grains with oxide purification. The sulphur was about 38 grains; with lime purification he used to get it down to about 12 grains.

Mr. R. S. RAMSDEN (Burton-on-Trent) said that since adopting the "C" process they had had great trouble indeed from naphthalene, and further considerable difficulty in getting "Solvene." He mentioned the matter to Mr. Bond, who suggested that Mr. Stevenson might be able to tell him something to help him over the naphthalene difficulty. Before starting the "C" process, the tar contained 1 gallon of toluol per ton; after the "C" process started, 1⅓ gallons; and when it was in full swing, up to 2 gallons. He went over to see Mr. Stevenson, who told him what he had been doing, and the results he had obtained. But he said most frankly: "This is what I have done at Long Eaton, with certain coals, and under my own running; and I do not suggest that you are going to get the same results." He was using practically the same coals as Mr. Stevenson, and with a considerable proportion of better class coal—South Yorkshire. Mr. Rollason recommended the mixing of 2 per cent. of limestone dust with the coal. They tried this, then 2½ per cent., then 1¼ per cent., and back again to 2½ per cent. They had tried different kinds of limestone dust. Several kinds had been condemned. After using many kinds—a good proportion of them were condemned as too coarse—he was sorry to say they had obtained no benefit whatever from the process. They had had a great deal of trouble with stopped pipes. Several times he had had to stop the process for a week, so as to have a good "spring clean." As to the ascension-pipes, instead of having one man on intermittently keeping the pipes of ten beds clear, he had had to have three men going. The stokers, too, complained seriously of the fires requiring more clinkering. From the toluol point of view, the process was a distinct failure. The toluol dropped from 2 gallons down to, using the "C" process, less than ¼ gallon per 200 gallons of tar. At the present time, the process was off again, while he was making another attempt to get the ascension-pipes thoroughly clean. Within the last few weeks, he had again communicated with Mr. Rollason, who said he had made an arrangement with a Buxton lime company to supply what he thought was an ideal limestone dust for the kind of coal carbonized at Burton. He (Mr. Ramsden) hoped to try the process again. He felt from the results Mr. Stevenson had obtained that there was a great deal in the process, and that there was a future for it, but that there was some little thing that they had missed at Burton. A few days ago Mr. Stevenson allowed him to send a chemical assistant and foreman to his works, to see if they could find out where the difference was. Up to that time, they had not at Burton hit upon quite such a thorough method of mixing the limestone dust with the coal as Mr. Stevenson had done at Long Eaton. They had an underground breaker, the usual hopper, and, as the waggon was tipped into the hopper, a man had put a gauged-boxful of limestone dust into it. Possibly this had not always been done with striking regularity when nobody was there to see it done. He was going to have bags to hold a certain amount of limestone—2½ per cent. proportion for a 12-ton waggon and for a 10-ton waggon. This the men would put on to the coal in the waggons before unloading. It would then be easier to see that the limestone was there, and give it a better chance of mixing.

Mr. STEVENSON, in replying to the discussion, said he should like to repeat that he did not put forward this paper on the lines of carbonizing pure and simple. He said all the object he had was to increase the toluol. This claim had not been disputed; or if it had been, he had not heard of it because they had constantly—using the same temperature of carbonization, and the same grades of coal—sent samples of tar to Professor Frankland, whose tests had proved, independently and conclusively, that they had more toluene and benzene in the tar when using limestone. This toluene had not been obtained at the expense of the gas or the quality of the gas. They had strictly adhered to the same grade of coal purposely to check their own tests; otherwise, he might have had some doubts as to his own figures. If there was no increase in the toluene, then he should like to know how it was that, without the limestone, the tar showed less toluene regularly. Directly they started using the process, they increased the toluene; directly they stopped it, they reduced it. The best results in the Midland district were obtained at a very small gas-works, where possibly some of them would say that the gas yield in the holder ought certainly to be increased. But this was not the case here. Mr. Bell had given some very pungent criticism with the best of motives; and he (Mr. Stevenson) appreciated his figures very much indeed. Now when at Long Eaton they had put on eight-hour charges, they had never got the same results as with twelve-hour ones. They had followed Derby to some extent in the matter of twelve-hour charges, because the benefits all-round were so great. The whole secret of the process was in heavy charges of twelve-hour duration. They would never get the same results with eight or nine hour charges. Time and mass were everything in the process. Mr. Bell had mentioned the question of sulphur. If the limestone was intimately mixed with the coal, and the coal was crushed small, there must be a big decrease in the sulphur. This had been proved in every test they had made. With regard to the coke, he had got samples for the inspection of the members. He could also say that he had sent coke to Birmingham for special purposes; and he should not have obtained the price he did, had the coke not been all that was desired. As to the analysis of the coke. The ash before the limestone treatment was 7·02 per cent.; ash after limestone treatment, 9·93 per cent.; sulphur in the coke before the lime treatment, 1·4 per cent.; after treatment, 0·9 per cent. These figures corroborated Dr. Lessing's suggestion in regard to the sulphur with the Cooper coal liming process. In reference to any trouble in the furnaces, they had experienced very little; and at a time like this, when everyone had to do his best for the country, one could add a little bit of trouble in this line. All he could say was that, if the trouble was very great, it would not be justified. The same thing obtained with regard to the Cooper process, that it did not add to the appearance of the coke but it did to its efficiency, so far as use was concerned. One would rather reduce his make 300 or 400 cubic feet per ton of coal if, in the national interests, it would increase the toluene. Mr. Bell said the illuminants in the Long Eaton gas were very high. They were actual figures; and they were left there to speak for themselves, without any doctoring of any kind. With regard to sulphur, he had never had anything like 30 grains for many years.

Mr. BELL: Will you tell us how you keep it down to that?

Mr. STEVENSON said he had had to sell clean gas; and the cleaner it was the better. He had never had 30 grains without lime, even before he went to twelve-hour charges. Mr. Bell also said there were an additional 100 cubic feet of carbonic acid in the gas, and that there should be a deduction from the balance-sheet for this. He put the costs in the balance-sheet, and left the other items there, and so their relative value could be judged. He could not to-day make gas at less than 1s. 6d. per 1000 cubic feet in the holder; and he did not think it could be made for 1s. to-day. There was a small increase in the calorific value per ton of coal. He did not attempt to explain the figures; they were there as actual ones. As to the coal liming process, the claim made at Cheltenham was for a large increase per ton of coal. He had never attained to this. Mr. Copp, Mr. Ramsden, and Mr. Morland said the same thing as to the increase of clinkering. At Long Eaton, they had not found the increase to be excessive; otherwise they would not have kept on the process. Mr. Copp mentioned that the theory was good. He (Mr. Stevenson) would be sorry to make himself responsible for the theory; he had been content to try the process strictly on its merits. Mr. Dougall was troubled with stopped pipes. He had gone to twelve-hour charges; and his coal was a fairly good one.

Mr. DOUGALL: I have never had trouble with the coke.

Mr. STEVENSON (continuing) said Mr. Morland's results were poor because he had six-hour charges in use. Mr. Ramsden's results he did not attempt to explain. They had consistently obtained an increase of toluene; and at a large works (the name of which he would not mention) had also regularly obtained an increase. Where the process had been used under proper conditions there had been an increase of toluene. He did not ask anyone else to use the process; he simply recorded his own results.

Moved by Mr. BELL, seconded by Mr. MORLAND, and supported by the PRESIDENT, a hearty vote of thanks was passed to Mr. Stevenson.

Mr. William Ford, for many years Manager of the Stockton-on-Tees Gas-Works, whose death was recorded in a recent issue of the "JOURNAL," left estate which has been proved at £9313.

TAR PRODUCTS: THEIR PAST AND FUTURE.

By J. Herbert Canning, F.C.S., of Newport, Mon.

[A Paper read before the Wales and Monmouthshire District Institution of Gas Engineers and Managers.]

The outbreak of the present great European conflict has made it clearly evident that an economic system based upon the hypothesis of perpetual peace is a source of national danger in time of war. We have been taught by most political economists that each country should cultivate those industries and manufactures for which it is by natural resources and other circumstances best equipped; but, like other broad generalities, this, too, is subject to important exceptions. There are certain products which are vitally necessary for carrying on war, and to be dependent for these supplies upon other countries which may at any moment be at war with us is the height of folly.

Recent events have amply proved that the coal-tar industry is one of the most important in this respect. Yet this country, to which the inception and building-up of this industry is entirely due, and which is more favourably situated than any other in the world for its development, has permitted it to be captured and exploited to our disadvantage by a nation less blessed by Nature but more alive to its own real interests. Germany, having for many years made science subservient to the preparation for aggressive war against her neighbours, has been fully aware of the fact that such vital industries are, like Samson's locks, the real source of strength in the hour of conflict, so, like Delilah, she assiduously lulled us to sleep, and had almost succeeded in depriving us entirely of them when, luckily, our eyes were opened. It is hardly conceivable that future English Governments will permit our strength to be similarly paralyzed, especially in respect of the manufacture of coal-tar dyes, which industry is so closely akin to the production of the high explosives required in such immense quantities for the supply of our Navy and Army.

It is so many years since—largely through our own fault—we lost this great industry that we are apt to look upon the loss as one of those inevitable and unavoidable misfortunes which from time to time fall upon individuals and nations alike. Unfortunately, however, this is not the case; and since the path of human progress is paved and made passable by our old errors and blunders, it may not be wholly unprofitable that we should briefly glance at the history of the coal-tar dyes, in order that our determination to remedy the mistakes of the past may be strengthened thereby.

History of Coal-Tar Dyes.

Although coal tar and pitch were manufactured in England at least as early as the end of the Seventeenth Century, they could be put to little or no valuable use until, early in the Nineteenth Century, the scientific examination and separation of the constituents of tar opened the door to the wonderful possibilities of the present day. In 1825, our countryman Faraday discovered the presence of benzene in the liquid found in the compressed-gas cylinders sent out by the Portable Oil Gas Company. It appears that the consumers of this undertaking made complaints of the presence of a liquid residue in the vessels of gas supplied to them; and, as a result, Faraday was asked to examine this condensed fluid, which he found to consist very largely of benzene. Further, most important pioneer work was carried out by Mansfield, who investigated and separated many of the coal-tar hydrocarbons, finally losing his life in the course of his experiments. This preliminary work laid the foundation for the epoch-making discoveries of Sir W. H. Perkin, who was a pupil of Professor Hofmann of the Royal College of Chemistry. In 1845, when the College was founded, the famous chemist Liebig was asked to nominate a suitable Professor for the Institution. His choice fell upon Hofmann, who commenced his duties in the year 1845, one of his earliest pupils being Perkin, who, while attempting the synthesis of quinine, discovered, in 1856, the first coal-tar dye, which was called by him "aniline purple." Specimens of this dye sent to Messrs. Pullar, of Perth, were reported upon very favourably, and, as a consequence, patent No. 1984 was issued on Aug. 26, 1856.

With the assistance of his father, Perkin started a factory for the manufacture of this dye at Greenford Green, near Harrow; but the English dyers were rather conservative in their patronage of their countryman's invention. The French calico printers, however, were quick to realize the great possibilities of the new colour, taking it up enthusiastically; and the name of mauve conferred upon it by them is the one generally adopted. The Royal College of Chemistry, under Hofmann's guidance, became a very valuable instrument of research, which had for its object the development of the rising industry. Mr. F. A. Mason, B.A., Ph.D., of the Royal College of Science, has, in a recent contribution to a scientific periodical, collected much valuable information upon the early history of the coal-tar dyes; and I am indebted to his article for much of the following statistical information respecting the industry.

In 1862, the annual value of the coal-tar dyes produced in England reached £400,000, and the industry's prosperity continued to increase until the year 1865. During these early years, Great Britain possessed a practical monopoly in the field; and so absolutely certain was Hofmann of the brilliant future of the industry that, in 1862, he said that: "Instead of disbursing her annual millions for these substances, England will, beyond question, at no distant day, become herself the greatest colour-producing country in the world—nay, by the very strangest of revolutions, she may ere long send her coal-derived blues to indigo-growing India, her distilled crimson to cochineal-producing Mexico, and her fossil substitutes for quercitron and safflower to China, Japan, and the other countries whence these articles are now derived." So little, however, was the English commercial world competent to grasp the vast possibilities involved, that, in 1865, Hofmann resigned his professorship for lack of encouragement; and with his return to Germany began the decline of the industry which he had done so much to foster. It is stated that, excepting at Perkin's Greenford works, scientific methods of controlling and checking manufacture were speedily abandoned, while research work was practically non-existent.

Dye from Coal-Tar Derivatives.

It would be totally impossible to attempt to enumerate the vast number of dyes produced from coal-tar derivatives; but the discovery, in 1869, by Perkin and the German chemist Caro, of the method of producing from anthracene, alizarine, the colouring principle of the madder plant, must be mentioned as a fact of the greatest importance. Caro, who was the chemist for a very large English dye-works at Manchester, was unfortunately permitted to return to Germany in 1866, where he became the Technical Director of the Badische Anilin und Soda Fabrik, which is now one of the greatest chemical undertakings in the world.

As a matter of fact, the alizarine produced in Germany very shortly ousted the English product from the market. In 1871, the Badische works sent out 150 tons, against an output of 220 tons from Perkin's works; but in 1873, the Badische works output was 1000 tons, against 435 tons produced by the English firm. A further misfortune, however, was in store for the English industry, for in 1874 Perkin retired from the manufacture of dyes to take up purely scientific work. At the time of his retirement, however, the industry was still in a strong and flourishing condition, and under scientific control would undoubtedly have more than held its own against the growing foreign competition. The number of trained chemists available in this country, however, at the time in question was extremely limited, and no adequate facilities existed for the teaching of organic chemistry.

Synthetic Indigo.

As a contrast with the apathy shown in England, and as a very interesting illustration of German thoroughness and foresight, the history of the production of synthetic indigo may be briefly referred to. The British Empire practically possessed the monopoly of the natural dye until nearly the end of the Nineteenth Century; and it is lamentable, as well as humiliating, to reflect that this great industry was permitted to be destroyed by the German artificial substitute without an effort on our part to retain the trade by solving for ourselves the problem of synthesizing indigo. About the year 1870, small quantities of indigo were produced experimentally; and had this country at that time taken up with energy the full investigation of the subject, there was still time to retrieve our position. We, however, allowed matters to drift; while, on the other hand, the Germans proceeded to attack the problem in a manner which would possess very scant attraction for the average hard-headed British commercial man. In the year 1880, the two largest dye-producing firms in Germany—the Badische Anilin und Soda Fabrik and the Hoechst Chemical Works—combined their scientific and financial resources with the view of solving the problem of the synthetic production of indigo. This working arrangement was carried on for seventeen years, during which period the two firms concerned staked no less a sum than half-a-million sterling upon their faith in the skill and resourcefulness of their technical staff. The result has been that the indigo trade of our Indian Empire has vanished. In the year 1896, the Indian exports of indigo reached the value of £3,569,670; while in 1914 the corresponding figures were £65,000. On the other hand, Germany exported in 1896, 581 tons of synthetic indigo, of a value of some £320,000; and in 1912, 33,000 tons were exported, the total value of which, in spite of the great reduction in price, was no less than £2,750,000. Nor has Germany been content to rest on her oars. She is restlessly and unceasingly pursuing the same methods of organized research which have yielded such amazing results in the past, and which will undoubtedly yield most unpleasant and disconcerting surprises for us in the near future, unless we are wise enough to profit from our past mistakes. Seldom does opportunity offer itself twice to mortals. But we have received the almost unexampled favour of a second chance; and it is to be hoped that we shall not commit the supreme folly of allowing fortune again to escape us.

Future of Benzol.

In addition, however, to the possibilities of retrieving our position as regards the production of synthetic products from coal tar, another great field for the utilization of coal tar constituents is now opening. It is becoming more and more evident as the war goes on that this country must, in the interests of national safety, possess its own internal supplies of liquid fuel. Before the war, benzol was rapidly advancing in favour as a competitor of petrol for the driving of internal combustion engines; and taking into account the fact that commercial benzol yields 12 per cent. more power than petrol, and is equally good as regards elasticity and prompt starting, it is evident that the future prospects of benzol in this connection are exceedingly good. It is more than probable

that, for some considerable time after the war is over, circumstances will militate against the extensive import of liquid fuel into this country. In any case, the enormous increase in the number of internal combustion engines is creating a very rapidly-growing demand for this type of liquid fuel, as the following figures, giving the imports of petrol into Great Britain during recent years, will show:

Year.	Gallons.	Year.	Gallons.
1905 ..	18,000,000	1909 ..	53,000,000
1906 ..	25,000,000	1910 ..	55,000,000
1907 ..	34,000,000	1911 ..	70,000,000
1908 ..	40,000,000	1912 ..	80,000,000

Gas undertakings will be well advised, therefore, to put themselves in a position to meet general requirements in this respect; and it is very probable, when the public fully appreciate the advantages of benzol, that they will not readily return to the use of petrol.

Our Past Faults.

With a view to considering the best measures to be adopted in order to regain our supremacy in the coal-tar industry, it will be advisable and necessary to consider briefly our past faults, and more especially our omissions. In the first place, all competent authorities are agreed that the decay of the British dye industry is due to the apathetic attitude of all classes in this country towards science, which is the result of insufficient scientific education. It is impossible for any of us to exhibit interest in a subject of which we know nothing. Hence the vast majority of our countrymen are, owing to our defective system of education, totally incapable of either appreciating, or sympathizing, with the objects of scientific research. The general public look upon even the highest scientific luminaries as harmless cranks, totally devoid of practical business ability; and, as a consequence of this lack of appreciation, it is hardly surprising that men of science have shown a natural shyness in coming into closer touch with the "man in the street." This is a great pity, in view of the fact that many of our scientists are so well qualified to present their knowledge in an attractive manner to a general audience; and it is certain that if, as in Germany, the pupils in our elementary schools received a grounding in elementary science, many of them would continue to feel an interest in such matters and in scientific lectures and demonstrations.

It is feared by many that if science is taught more extensively in our schools and universities, the literary side of education will, of necessity, suffer; and if this view were correct, it would undoubtedly be a very serious drawback. However, there is not the slightest doubt that these fears are totally unfounded, and that literary and scientific education may proceed simultaneously until such time as the student decides to specialize in certain subjects. Not only would there be no disadvantage in this system of education; but it would have the effect of preventing the mental one-sidedness, which is unfortunately so often characteristic of those whose training has been either exclusively classical or scientific. Of course, the scientific student must specialize at an early stage if he is to attain the requisite degree of proficiency; but a plea may here be made for the adoption of a method of training more fitted to qualify him for the actual practical work of life than has been the case hitherto. Steps are being taken in this respect by our educational authorities. It is an unfortunate fact, however, that too often in the past students have, to use a common simile, been trained to swim with corks; and when these are lacking on their entry into practical life, they are helpless. The students of the present and of the future must possess the necessary knowledge and initiative to enable them to conduct independent research, and must, like a pioneer, be capable of striking out new paths and of subsequently guiding others along them.

The Chemist in Industry.

On the other hand, postulating the necessary supply of well-trained engineering and chemical talent, are the present prospects open to young men sufficiently attractive to induce them to undergo the long and laborious training necessary and to justify the requisite heavy expenditure thereon? It must, unfortunately, be stated that, as things stand at present, a young man entering either of these professions must be actuated by the very rare motive of love of science in the abstract, and must be prepared to sacrifice both the prospects and remuneration attaching to occupations for which the preparation is far less arduous. It must, however, be said to the credit of many English firms that they fully appreciate the value of the technical expert, and pay him accordingly. But as far back as the year 1877, the late Professor Church pointed out that the decay of the chemical industry in England was due to the want of appreciation of the services of skilled chemists, and the consequent lack of the competent men required. He pointed out that, even at that time, one German chemical factory had six assistant chemists (not practical managers) and one chief chemist—a distinguished man of scientific reputation; the latter receiving a salary some £2000 a year, simply for investigation and for original work in the laboratory. This, however, would be a very small staff for a modern German chemical works. In 1912, the Hoechst Chemical Works published a list of their employees classified as follows: Engineers, 74; clerks, 611; foremen, 374; workmen, 7680; chemists, 307. It is just this appreciation of the supreme value of technical knowledge in the more delicate branches of chemical manufacture that has enabled the Germans to capture this British industry; and we can only hope to regain it by thoroughly training our own men in the proper manner, and paying them adequately when they are duly qualified.

At the beginning of the present century, Sir William Huggins drew attention to our lack of suitably trained men possessing technical knowledge; and some of his words seem prophetic in view of the present-day crisis. He traced our deficiency in this respect to "the absence, speaking generally, of a sufficiently intelligent appreciation on the part of the leaders of the nation—whether as legislators, capitalists, manufacturers, or merchants—of the supreme importance of scientific knowledge and scientific methods, not only for the successful carrying on and improvement of all industrial enterprises, but also, and not less so, for the working-out of all national problems whatever, whether of education, of economics, of hygiene, or especially of national defence in the construction of our armaments by sea and by land, and the training of our soldiers and sailors." It is to be hoped that no great Englishman will ever have reason to use such words again.

Drawbacks of the British Patent Law.

After the lack of scientific education and of skilled technologists, the next greatest obstacle to our progress in the manufacture of dyes and synthetic products is the fact that the British patent law has been so devised that the Germans have been able to make of it a species of barbed wire entanglement against the British inventor and manufacturer. Without entering too deeply into the matter, it may be briefly stated that German firms and individuals have been in the habit of filing dummy patents which are never intended to be worked, but are simply to prevent British subjects making any use of the process referred to in the German patent specification. Mr. Mason, in the article above referred to, has dealt at some length with this very important question; and he points out that in the five years 1906-10 there were filed for synthetic dyes and intermediate products no less than 561 German patents to 30 English. These figures surely need no comment; and it must be the care of British Governments in future to see that no such possibilities are open to our enemies.

Another obstacle has been the extreme unwillingness of the Excise Authorities to relax their restrictions in such a way as to permit of a cheap supply of industrial alcohol. The Minister of Munitions, however, has solved this problem; and it may be confidently hoped that matters will never again be allowed in this respect to return to the state of affairs prevailing before the war.

The Need for Prompt Action.

The above opinions and suggestions are merely advanced with the view of awakening interest and bringing about a discussion on this very important matter; but there is not the slightest doubt that the real root of our failure lies in the neglect of scientific education. In an absolute monarchy, it is necessary only that the monarch himself should be educated and enlightened; and he can then apply his knowledge and wisdom to the benefit of his country. But as under our free institutions the people collectively possess the supreme power, it is necessary that a very considerable majority of the population should be sufficiently well-informed to enable them to form correct judgments on matters which intimately concern their own interests and their future welfare. In this work of reform, the responsibility for taking the initiative rests, of course, in the first place with the Government; and in order to avoid touching upon politics, no mention has been made of many obvious and powerful forms of governmental assistance. It is necessary, however, that those who are in a position to know the facts of the case should urge upon the authorities the necessity for prompt measures, as we are likely to be faced at the end of the war, not only by organized German effort, but also by so many other problems consequent upon the war, that there will be very little time to improvise plans for winning-back our former supremacy; and in any case schemes devised in a hurry are seldom of much use. It is supremely important, therefore, that the gas industry, which is so vitally interested in the recovery of a branch of trade almost infinite in its possibilities and British in its origin, should take prompt action, if necessary in union with other interests, to urge upon the nation the absolute necessity for the removal of old obstacles, and the provision of new facilities, in order that we may once more come by our own.

DISCUSSION.

The President (Mr. J. E. Kenshole, of Merthyr Tydfil) said that personally he felt very grateful to Mr. Canning for his paper. Not only would they have to study it, but they would have to act upon it as well, and see whether they could not "do their little bit" towards furthering the dye industry in this country. The question of benzol, of course, was one of vital importance to them. He would ask Mr. Doig Gibb first to make a few remarks.

Mr. W. Doig Gibb (London) said he would like to thank them for giving him the opportunity of being present at the meeting, in his capacity of President of the Southern District Association of Gas Engineers. It was his first visit both to that part of the country and to the Wales Institution; and if the paper which they had just had the pleasure of listening to was to be taken as a criterion of the usual proceedings, the Institution certainly lived up to a very high standard of excellence. At the same time, he did not know that there was so much to discuss in the paper as to think over and act upon. The portion which was of special interest to him personally just now was, of course, Mr. Canning's reference to benzol. He felt, however, that they must all be in thorough sympathy with what the author had said, from beginning to end.

Mr. H. D. MADDEN (Cardiff) remarked that the paper dealt well with what was one of the most difficult subjects in the world to tackle—especially at the present time. The history of dyes was not easy of access, and many facts were not readily obtainable in relation to the working-up of the dyes. On his way down to the meeting, he had noticed a statement in "The Times" that a meeting of leading firms, presided over by Mr. Charles Carpenter, of the South Metropolitan Gas Company, had been held in London the previous day, to discuss the formation of an Association of British Chemical and Allied Manufacturers. From what was said there, it seemed that the future of chemical work rested with organization and the training of the chemists. They must have well-trained and what might be termed organized chemistry. When he spoke of organized chemistry, in connection with the dye industry for instance, what he meant was that the work done in colleges, &c., should be carried on from stage to stage by succeeding sets of students, without continually starting *de novo* as each fresh lot of students came up. A careful record should be kept of work that had already been done. This, he believed, was the system prevailing in Germany before the war. Certain colleges had certain points to work upon; and they had to carry their conclusions to a definite stage. In this way, after a group of men had completed their university training, the information gained was not lost, or shelved, but was submitted to the next batch of students to carry a stage further, until they thoroughly knew the ins and outs of the particular question tackled. One of his own relations, after learning all that he could in England, was sent by his people to, he thought, the same works that Mr. Canning had mentioned in his paper—the Badische Anilin und Soda Fabrik. He was there for two years, studying aniline matters; and when he returned, he said that there were over 200 chemists on the works, in different laboratories. Each branch of work or particular colour had its own laboratory; and the chemists specialized in that one thing, and nothing else. They were not testers in the ordinary sense of the word, but really highly-trained chemists. The way in which they tackled questions was astonishing. The statistics contained in Mr. Canning's paper were extremely valuable, and would well repay careful study at home. They were much indebted to him for bringing the subject so well to the front at the present juncture.

Mr. W. C. JACKSON (Neath) said undoubtedly the paper offered plenty of food for thought, and it also made them individually responsible for spreading the information contained in it among influential people in their own districts. In this way, education could probably be helped. There was every reason to believe that the lack of secondary technical education was a great drawback to the whole of the country; and this was a matter upon which people should be enlightened. The members ought therefore, as far as they possibly could, to influence men who were in a position to do so to bring forward a better scheme for local technical education. They themselves, as engineers and managers, had also a large responsibility towards those who came under them from time to time as pupils or as youths on the works. They ought to encourage these lads, and see that they were in the way to get proper technical education. These things would help the industry in the future to rise to greater heights.

Mr. THOMAS CANNING (Newport) expressed the opinion that the paper was of considerable practical importance at the present time, because it was suggestive of what they ought to be doing—and there was not very much time in which to do it. It had been stated in the newspapers quite recently that the dye-producing establishments of Germany had formed a very large combine, and that in future they had determined to take up the supply of the whole world's dyes. He might say, of course, they had never given up the manufacture of them. The making of dyes had gone on in Germany all through the war, and was going on now. They had been able to run it side by side with the preparation of their high explosives. Consequently, they must have accumulated a large stock, quite ready to put on the market at once. Well, in this country they had been doing a good deal in producing for some time past two great constituents—benzene and toluene—both of dyes and of high explosives. They had been producing them for the Government, for the highest possible patriotic purpose; and it would be a great pity now if, having produced these two very important factors, they did not carry the matter right to its final conclusion. There were, of course, other factors of importance besides the two he had named which went to the making of dyes; but they constituted by far the largest portion of the elements from which the dyes were derived. Some of them might be wondering what they were going to do with their coal tar after the war; and a good many people thought the question was being discussed less from the patriotic aspect than from this point of view. He would, however, like the public to know that there could be no question at all about it that, whether or not England took up the subject of manufacturing these dyes, they would be manufactured outside Germany, both in France and in Japan. He had been at pains to get information on the matter; and he felt convinced that, whether or not England got to work, the two countries he had named would. Thus there would always be a market for coal tar and its products. Dyes the people must have; and the point of view which the author urged was that it was to the interest of the British public to use the commodity of which they possessed so much, and manufacture those dyes mainly of which they had hitherto been importing such a very large quantity. There was no doubt that there had been great slackness in this country, though it would be impossible to trace it home to its source. The French described it as *laissez faire;* and he would not say more, because he believed the expression had a political significance. He hoped, however, that no political considerations would be allowed hereafter to stand in the way of the progress of the country. He was under the impression, though, that they must not wait so long as for the education of the young school of chemists. It would be necessary to get along more or less with the chemists they had at the present time; and it must be remembered that they were not altogether bereft of chemists. There was a fairly good supply of men who had been well trained, and many among them were well known while a number more would probably have been as well known if the country had given them opportunity and occupation. Education was a matter with which he had been closely associated, and in which he took immense interest. He had been connected with it for years in every one of its branches—elementary, secondary, technical, and university; and he was bound to say, with a full knowledge of its present condition in this country, one should not expect too much from it. It was amorphous; it was not in shape. Education here was not yet organized. A great deal of money had already been spent, and very much more would have to be expended before the right kind of work was done in the schools and in the colleges; but this no doubt would come in time. While agreeing that young men must be educated rightly in the future, he wished to emphasize the necessity of forwarding the work of education in this country without ignoring by any means its literary side, because if they did this they would be doing what had been done in Germany. They would create a nation of godless materialists, fit only for carrying on the revolting work the Germans were now doing day by day. He did not want to see this in England; and he hoped they never would. At the same time, if they cast their minds about, and thought of inventions (say) in the mechanical world, which of the names of the great professors of colleges were connected with the invention of the motor-car? Probably they would find it hard to hit upon one. For the most part, the men connected with it were practical men, ranging up from the working man at the bottom to the trained technician at the top. And the bulk of them derived 75 per cent. of their training by self-teaching. The same thing with the aeroplane. If they looked out for the wonderful expert, they would not be able to find him. Again, it was necessary to go among the men who were engaged in practical work, just as those present were, every day. He did not know what form it might take if these other people did get to work; for an English combine was not like a German one. An English combine had very great freedom, which might be used in many ways, and not invariably to the advantage of the public. He would like now to say a word or two with regard to Perkin. Certainly, he was a very great chemist. It was thought sometimes that he discovered his dye by accident; and so a legend had been built up about the wonderful acumen of the German chemists. It was a way that Germany had of imposing upon various countries—of making other nations believe that she alone had the greatest chemists and the greatest scientific men. She had not. Speaking with a knowledge of the matter, he maintained that he had really seen many far abler men in England, France, Scotland, Wales, and Ireland than ever he had seen in Germany, or belonging to Germany. ["Hear, hear."] He was quite satisfied about this. Perkin knew what he was doing when he invented his dye. Probably he had his mind on quinine at first; but inasmuch as there was no dye in coal tar, it was quite certain that he could not have picked it up by chance. From the coal tar were produced an enormous number of groups of hydrocarbons; and it was a purposeful combination of certain of these which went to form the dye molecule. Therefore it was a thing which must be done of purpose; and it was perfectly certain that Perkin substituted aniline for two of the chemicals he had been using in his quinine research, as soon as he set out in pursuit of the dye. How right he was, history had already shown, because the aniline dyes formed the great proportion of these wonderful coal-tar dyes. But the molecule itself was not a dye; and it could not be made a dye until it had been rendered capable of combination with some acid which was soluble in water. The salt was precipitated, which was the dye. This was the very process that Perkin came to. It was the same process in all these big German factories to-day. Perkin was the real founder of the industry of coal-tar dyes. He was a genuine chemist, and he was the builder-up of the first synthetic dye. Processes had been improved, of course, and new dyes had been discovered and put upon the market; but in the main they had not travelled away from the principles that guided Perkin in his invention. With respect to indigo, British India had lost a great deal of the cultivation of the plant, and possibly might lose the whole of it. He thought the most important purchaser of this dye at the present day was Japan. The Japanese would, however, as he had stated, very shortly be manufacturing synthetically their own dyes. It was quite certain they would not take them from Germany after the war was over; neither would France. Forty years ago, when the West of England cloth manufacturing industry was in full swing, he perfectly remembered going to the factories, where they used a great deal of blue indigo; and he saw a German there, who was beginning to prowl. He was not allowed then to supply any of his synthetic dyes; but he was, as usual, beginning to tell the most bare-faced lies. Among other things, he said the indigo from India was adulterated; and no doubt as time went on, though he did not do so then, he secured a footing by means of his lies. Now, according to information he

(Mr. Canning) had from a very good source, the Germans were supplying dyes to the Turks; and it seemed that these dyes were really and truly being adulterated. In view of all the facts which existed, were the people of this country going to be content to have Germany dyeing their clothes? Were they willing to have Germans supplying dyes for their linens, their woollens, and their cottons? He knew that many people wanted dumping in this country, and there were plenty of pro-Germans about (he was not speaking in the sense of nationality) who would be willing any day to see this trade re-commence. But were the people going to rely upon it? Was it safe? Were the Germans going to send to this country the best of their dyes, or were they going to treat England as they did Turkey? And even if the work was well done, might it not be done at home instead? What he had wished to dwell upon particularly was that this country must be wide awake to the fact that this was not a mere matter concerning the gas industry and the disposal of their products; for in any case they would be able to dispose of their tar products. The great point was whether they should not be disposed of to the greatest advantage of the nation. This was what they wanted in the first place. Of course, also, all consumers were interested in the matter, because the better the price obtained for these products, the cheaper the gas would be. Another point to remember was that the dye industry was a key industry—it opened the door to many large industries employing millions of men. Were these men to be thrown out of work through the filching-away of trade, in looking after which England ought not to lose a day?

Mr. W. B. Mimmack (Pembroke) said he hoped other Associations throughout the kingdom would take this matter up, and that it would not be allowed to fall flat. When listening to the paper, he recollected that it had been his privilege to be present at a Cantor Lecture delivered many years ago at the Society of Arts by Perkin, in connection with his discovery of these dyes; and he remembered very well the great excitement caused in the room by the exhibition of certain dyes. At the meeting, the leading men of the country who spoke of the discovery prophesied for it a marvellous future, and that the result would be a very great accession of wealth. These prophecies had been fulfilled; but they had been fulfilled in Germany, and not in this country. The business had been allowed to slide away altogether; and to-day they were suffering as the result. He was credibly informed that if the Germans paid to-day twenty times the price they had been paying for coal-tar products, the ultimate products as they issued from the German factories would be very little enhanced in value. That would give members an idea of the losses which this country was incurring on its coal tar as the result of allowing the Germans to exploit the markets in the way they had done. It was not much use them saying what other people ought to do in order that the business might be taken in hand for the benefit of this nation. Advice of this kind, it seemed to him, should begin at home, and every gas-works should have its qualified chemist. On consideration, it would be realized that there was money in it. They would soon be able to afford on their works a properly qualified independent chemical staff, who would carry out for them so many of the researches of which they stood in need. It was impossible at this meeting to enumerate all the subjects that required elucidation at the hands of expert chemists. To mention one only, there was the oxide purifier. How much did they know about what went on in an oxide purifier? They might pride themselves on being able to follow the process pretty closely; but if they asked themselves seriously what they knew about it, he thought they would feel bound to confess they knew very little indeed of what the process was. Some years ago, he saw a paper which was read before one of the French Societies by the Engineer of the Rouen Gas-Works, in collaboration with the engineer of another works. This dealt with what went on in oxide purifiers; and so far as he could remember it was the only anything like full contribution on the subject which had ever been brought forward. This was but one of many matters which required looking into; and if the paper they had just heard proved the means of rousing gas men to the necessity of having a properly qualified chemical staff on the works, it would not have been written in vain.

Mr. R. A. Browning (Neath) proposed a hearty vote of thanks to the author for his paper, which he said should be taken up by Government, so that the information in it might be circulated.

Mr. J. Mogford (Briton Ferry), in seconding, remarked that the subject was of great interest to the country at large; but it was perhaps of even greater interest to Wales than to any other part. They were in a district which must have a very large production of coal tar; and all the members of the Association should impress upon everybody they came in contact with the need for doing everything possible to carry out the views of the author. He felt rather disappointed with some of the remarks of Mr. Thomas Canning. Knowing the interest that gentleman took in education generally, he was sorry to learn from him that, under the educational system in their locality, there was not much hope of getting chemists in the next little while. There were men who hoped to become chemists, and who would become chemists, if there was sufficient encouragement offered them. It was the duty of the members, as far as they could, to foster the principles laid down in the paper. They had a locality suitable for the work; and they had the material for training the chemists. He hoped everyone would do his best against the Germans.

The vote having been heartily carried,

Mr. Canning, in acknowledgment, said the first thought he had in his mind when writing the paper was that if they were going to do anything with the tar industry in the future they must find an outlet for the products; and the only way he could see of doing this was by stimulating the output of synthetic products, and then dealing with the light oils and middle oils as fuels. If gas undertakings wished to have a little more control over their tar than in the past, the matter rested largely in their own hands. They should take as much interest in tar as they had been in the habit of taking in coke and sulphate of ammonia. He was afraid the old tradition had survived—of the days when tar was valueless, and was thrown away or burned. No doubt, they had not been altogether blameless in this matter in the past; but now dehydration plants were easily installed and easily worked, and they were a powerful weapon of control in the hands of the gas industry. Mr. Madden had pointed out that a combination was being formed in the chemical industry with a view to meeting German competition; and as Mr. Carpenter's name was mentioned in connection with the matter, he (Mr. Canning) hoped they would obtain better conditions than had been the case previously. He might be of a suspicious nature; but when an Association of this kind had been formed among the chemical industries, he had generally found it was for the purpose of squeezing gas undertakings a little harder. The gas industry should awake, and see that they participated to a proper degree in the revenue to be obtained from one of their most important products. He thanked them very much for the kind reception they had accorded him.

THE UTILIZATION OF PITCH:

ITS CARBONIZATION, AND USE UNDER BOILERS AND FOR BRIQUETTES.

At the Meeting of the Midland Association of Gas Engineers and Managers last Thursday—the President (Mr. C. H. Webb, M.Sc., of Stourbridge) in the chair—there was an informal discussion on the question of the utilization of pitch. Particulars were given as to its carbonization with coal, and its utilization in the form of dust for heating boilers, and in briquette making.

The President said he put the subject on the *agenda* because it was one of importance at the present time. He asked Mr. Thomas Berridge to introduce the matter; but he was unable to be present. There were, however, several other members who had experimented on the carbonization of pitch, and had experience of disposing of it in other ways. It would be interesting if those members who had done so would give their experience. Personally, he had not been able to go into the carbonization of pitch; but he was hoping to do so.

Mr. W. Chaney (Birmingham) said his experience in the carbonization of pitch was limited; but he found that they did get some advantages using small quantities in admixture with the coal. Using up to 2 per cent. of pitch, they had some increased value in B.Th.U. It was debatable whether, if they went above 2 per cent., there was not a distinct loss—not in regard to enrichment, but through the difficulty of adding the pitch to the coal in such a manner that it could be dealt with by the machinery. In all machinery there were moving parts; and if they had an excess of pitch, they lost in the bulk of coal put into the retorts. In one of the works, they had had trouble with pitch coming down and getting into the pipes. At these particular works, they had an increase in the cubic feet of gas made per ton. The general idea he had obtained was that the advantage was not an excessive one. If they put it down at 1 per cent. on the make, and 1 per cent. on the B.Th.U., this was a fair figure to take. He might point out, in connection with their experiments, that they had not been made on coal-gas pitch, but on Mond-gas pitch; and this pitch had a distinct difference, being more brittle, and a very much less quantity of oil was left in it on account of the market price. They found it very much better to distil the whole of the creosote oils out of the pitch, and so sell that which had a market value just now, and then turn the pitch over for carbonization.

Mr. J. Ferguson Bell (Derby): Will Mr. Chaney tell us whether the experiments were made on verticals, inclines, or machine-worked retorts?

Mr. Chaney replied that they had tried the pitch with the Fiddes-Aldridge stoking machinery. There was, however, a difficulty, because they were unable to fill the retorts with the machine. Consequently, the advantages were not so good. As had been pointed out, one got advantage in the use of pitch, with a larger bulk of coal, as one undoubtedly had a larger quantity of solvent oils in the tar, which enabled them to carry the gases from the pitch. They were working eight-hour charges at the Adderley Street works, with 9 cwt. of coal per retort, but only half full; and the heat towards the end of the charge got somewhat away, and a good deal of the pitch got into the ascension-pipes. They also tried the pitch mixed with the disintegrated coal used in the coke-ovens. With the ovens, it was the practice to run the mains dry; but with 2 per cent. of pitch, notwithstanding that they flushed out the hydraulic mains with tar to keep them free, they were compelled to stop the experiments on account of the formation of thick tar in the hydraulic mains.

Mr. Bell said he had not had any experiments with pitch carbonization at his own works; but at one works, where he was consulting engineer, they tried it in inclined retorts, and it would

not answer. The pitch fused, and stopped the coal running down. The charges banked-up, and then came down with a rush on to the floor. As to carbonizing in large bulk, he had spoken about the use of pitch to some people interested in coke-ovens—coke-ovens similar to those in Birmingham; and they told him they could not employ pitch. This seemed to corroborate the results at Birmingham. But regarding the use of pitch in horizontal retorts, he intended to try it. It was purely a question of £ s. d. They must buy the pitch at the lowest price at which it would pay them to carbonize it. If they could use it, it was their duty to do so, because they benefited themselves. When they remembered the quantity of pitch that there was in a ton of tar, and that it was now unsaleable, it showed how important it was to try and take some off the market, so that when things became normal there would not be mountains of pitch to be cleared away before the price returned to anything like its real value. He thought the tar distillers could well afford to meet them liberally in the matter of price, because it was in their interests, as well as those of gas undertakings, to try to reduce the accumulating stocks.

Mr. CHANEY said he omitted to mention that another use for pitch was in connection with boiler fuel. At the present time, coke was at a prohibitive price for boiler fuel; and it had been found that, by grinding pitch into fine dust, and feeding it into the boilers very similar to the old tar-burning arrangements with an injector, one got a very fierce heat and a very effective means of firing boilers—that was to say, if the pitch dust was blown in by means of an air-blast, they had an intense heat just above the furnace arch, immediately where it was wanted, and, if the air was in excess, they had no troubles in the way of smokiness of the chimneys.

Mr. W. G. S. CRANMER (Willenhall): Is it not necessary to have very hard pitch?

Mr. CHANEY said it was better to have very hard pitch to get it into fine dust. As a matter of fact, moist pitch would not disintegrate. They were able to produce the very pitch they wanted. All the creosote oils were taken off; and, consequently, the ordinary pitch was brittle, which facilitated grinding.

Mr. VINCENT HUGHES (Smethwick) remarked that the President had asked him to say something on the utilization of pitch in the production of briquettes. He had had no time to prepare any statement of particulars; but he might say that, in the manufacture of briquettes, they not only assisted the tar distillers, but at the same time they were getting rid of a troublesome commodity in the shape of coke dust. He did not know how they were all fixed in the old days; but probably at the present time there were works where the coke dust and the breeze were shovelled together into the customers' carts, and there was no trouble then with coke dust. How such gentlemen slept at night with such a thing on their conscience he could not tell. [Laughter.] For some few years at Smethwick, they had been badly troubled in disposing of coke dust. It had been costing them from 1s. to 2s. per ton to get rid of; and yet coke dust was a valuable fuel, or ought to be. Briquette making from coke dust was not quite new. He knew of plants which he had been privileged to see—plants in the district—but which were closed-down because the results were not satisfactory; and it was some time before he got hold of a plant that he thought was satisfactory. There was a question of terms as to what was dust and what was breeze. He had a gentleman from Lancashire to see him; and he stated that he termed all dust what in the Midlands they termed breeze and dust. The market where this gentleman came from was different from the market in the Midlands; and so his visitor did not go to the trouble of screening the breeze out at all. In this particular town—and it was a large town too—the whole of the breeze and dust was sold, he informed him, at from 2s. to 2s. 6d. per ton. At Smethwick last year, they made about 22,000 tons of coke, which, of course, had a very ready sale. They made 3600 tons of breeze, and over 3000 tons of dust. The breeze they could sell; but in those works where they did not separate the breeze from the dust, it might be well to convert it into briquettes. In the manufacture of briquettes, they used 8 to 9 per cent. of pitch, as well as a little tar—the tar being very necessary. The pitch they mixed with the coke dust. If they took 3000 tons of coke dust, and put 8 per cent. of pitch in it, they would dispose of 250 tons of pitch in the year. This would relieve the market a little. In a works—say, of the size of his own—where both the breeze and dust were utilized, some 500 tons of pitch would be used. To give some figures for the members to work upon, last year at Smethwick they made 527,000 gallons of tar. If they took 60 per cent. of this tar as being converted into pitch, it would mean that during the year there would be produced 1581 tons of pitch. By taking 250 tons for admixture with the coke dust, this would be one-sixth of the production of pitch. If the whole of the breeze and dust was utilized for briquette making, they would require $33\frac{1}{3}$ per cent. of the pitch production; and if every works could use one-third of their own pitch in this way, it would reduce the quantity on the market very considerably.

Mr. MORLAND asked what was the size of the screen the dust passed through?

Mr. HUGHES said the perforations were about $\frac{3}{8}$ inch; but the result did not altogether depend upon the size of the perforations in the screen, but upon the rate at which the screen revolved, and also the angle at which it was placed. It was quite a simple process. The pitch and the dust were fed at floor-level through two little hoppers; and the proportions of the two articles were automatically mixed. There was no trouble about getting the proper proportions. The material passed into the disintegrator below the floor-level, and was then elevated to a steamer; and they wanted pretty hot steam there. They had to work up to 80 lbs. pressure—100 to 102 lbs. would be better, because it was dry steam and hot steam too. After being heated the material was passed into the dies, and it was then pressed into the form of briquettes. The machine was really designed to give a pressure on the briquettes of abput 2 tons per square inch. But they worked it at a pressure of about 30 cwt. per square inch; so that the briquettes were subjected to something like 6 to 8 tons pressure. He had tried burning coke dust with a forced draught; but the results were certainly not very satisfactory. The flues became filled with dust; and there were other troubles. With the briquettes, they found these troubles practically vanished, although he ought to say that he knew of one manager who found dust was carried forward to the flues. He must, however, have an extremely strong draught to do this. In one of his boilers at Smethwick he had draught enough; and the dust was not carried forward. For household purposes, the briquettes were doing some good. Both poor people and well-to-do people had come for the briquettes again and again. They had been coming the whole of the winter, and were very pleased with the briquettes. He could not say that everyone spoke highly of them; but generally people were satisfied with them. Mr. Bell had had a sample of the briquettes; and he said that he found a lot of ash in them. He (Mr. Hughes) found a great deal in his coal at the present time; so that the briquettes they were turning out now were not quite so good as they would be in normal times. The coke dust was formerly costing him 2s. a ton to get rid of. They were selling the briquettes at 12s. 6d. per ton; and they had a demand larger than they could satisfy. They had a double machine, and each machine produced about half a ton of briquettes per hour; and there was no question that it really did more than this. The plant was very simple. The only trouble they had had was with the cutting of the dies, through the coke dust being so hard; but using coal quite another story would be told. Dies which lasted six months in the manufacture of coal briquettes would not last a week with coke dust. They had now got them to last about three weeks. To change them, cost only a trifle—from 1s. to 1s. 6d. Answering questions, Mr. Hughes said the capital outlay on the plant was £1000—that was the pre-war price. The cost of production, including labour, and reckoning the coke dust at nothing (seeing that it formerly cost 2s. per ton to get rid of), was just a little under 5s. This did not include interest. But they could, as a matter of fact, take the 2s. off the 5s., seeing that it formerly cost 2s. to remove the dust. While they sold at 12s. 6d., having a big demand they could get 15s. or £1 for the briquettes. They charged the people who fetched them in carts 9d. per cwt., which would be 15s. per ton. The investment was a very good one. The briquettes did remarkably well in kitchen grates; but for sitting-room use, some people had not found them burn so successfully. Perhaps the chimney draught was not quite right; and the briquettes would not act alone if a nice bright fire was required. They had supplied the briquettes for laundry and welding purposes, and for melting brass and other metals. One merchant in Birmingham took them by the boat load, and sold them in the city for domestic purposes.

The PRESIDENT remarked that the utilization of pitch was important at the present time, as it reflected on the price of tar. This was a matter that had been worrying the Commercial Section very much lately; and therefore it warranted close attention. He did not realize what could be done in the matter of utilizing pitch until he went into it, and found that it meant that if pitch to only $2\frac{1}{2}$ to 3 per cent. of the coal carbonized was used, they would be utilizing the whole of the pitch they were producing, at each of their works. In his own case, he dehydrated the tar. The light oils were sold to the tar distillers; and the whole of the pitch in the dehydrated tar was utilized on the roads. It was very well out of the way in that direction.

Corbet Woodall Scholarship and the Research Fellowship at Leeds.

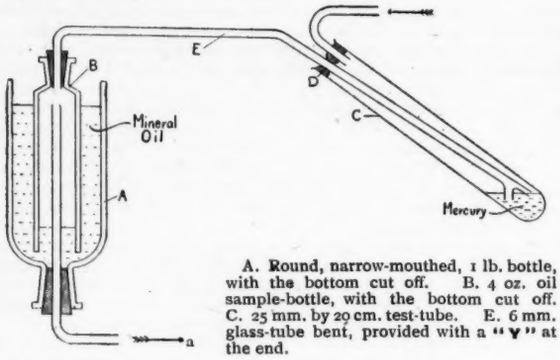
Attention may be specially drawn to two advertisements appearing in this issue of the "JOURNAL," which emanate from the Department of Coal Gas and Fuel Industries at Leeds University, where the Livesey Professor is Mr. John W. Cobb, B.Sc., F.I.C. This year the Department are for the first time advertising the Corbet Woodall Scholarship in Gas Engineering, which is offered for competition by candidates who desire to enter the University in October next. While hoping that it may thus be possible to secure the right man for the scholarship, it is, of course, not desired to keep an eligible man back from military duty. It is felt, however, that there may be forthcoming either somebody of the proper type otherwise, but medically unfit for military service, or a youth under age. The authorities considered the matter carefully, and decided that, on the whole, it was better to see what sort of response would be made to the advertisement. The same remarks apply to the other advertisement—the subject of which is the Gas Research Fellowship—excepting that nobody under military age could be sufficiently far advanced for this.

Mr. B. A. Lewis, the Manager of the Carmarthen Gas-Works has had a picture accepted at the Royal Academy this year.

A GAS PRESSURE REGULATOR FOR USE IN THE LABORATORY.

In a communication to the American "Journal of Industrial and Engineering Chemistry," Mr. J. R. Powell, of Chicago, has described an arrangement for automatically delivering gas at a reduced but constant pressure, irrespective of variations of the initial pressure.

He pointed out that occasion arose in his laboratory to make use of a gas-heated thermostat, but a great deal of inconvenience was experienced because of the varying gas pressure. In casting about for some simple pressure regulator, the apparatus illustrated was finally hit upon as a practical solution of the trouble. It will be noted, he said, that it is constructed from material readily obtainable in almost any laboratory; also that there is no great skill required for its assembly—practically every chemist having the rudimentary knowledge of glass-blowing necessary to make the one Y required.



A. Round, narrow-mouthed, 1 lb. bottle, with the bottom cut off. B. 4 oz. oil sample-bottle, with the bottom cut off. C. 25 mm. by 20 cm. test-tube. E. 6 mm. glass-tube bent, provided with a "Y" at the end.

A and C are rigidly fastened to a board which acts as a mounting for the whole apparatus. B is suspended inside A on the end of E by a rubber stopper D, so arranged that it may have a slight lever movement about the point where it passes through the stopper, as a fulcrum. The stopper is cut very short; and, to give the tube E still further freedom of movement, the hole cut for it may have the edges grooved on both sides. The Y on the end of E should be constructed with a rather small branch (about 2 mm.) as the extension of E; while the branch looking down should have the full opening of E (6 mm.). When B is depressed, the small branch of the Y should be raised just above the surface of the mercury that fills the lower end of C—the larger branch of the Y remaining below the surface. When B rises slightly, both openings of the Y will submerge in the mercury. With the assembly made as described, A is filled about two-thirds full of mineral oil and the apparatus is ready for use.

Gas flows into C through the tube connection shown; and from there through E to B and out through the tube from A. As soon as the pressure builds-up sufficiently on the delivery side, the bell B floats-up slightly, plunging the end of E below the mercury and shutting off the gas till the consumption again slightly reduces the pressure under B. As the end of E rises from the mercury, the slug of mercury that has closed the small branch of the Y is forced up into E, but is permitted to flow back through the lower branch of the Y. The gas pressure on the delivery side can be regulated by the weight of B or the length of E.

Northern Star Lodge.

The installation meeting was held at the Midland Grand Hotel, Manchester, on Friday last, when Bro. E. J. Wellens, of the Grimesthorpe Gas-Works, Sheffield, was installed as W.M. by the outgoing Master Bro. J. M'Ewen. Subsequently, the following officers were invested:

Bro. J. Bond, of Southport	Senior Warden.
,, J. W. Morrison, of Sheffield	Junior Warden.
,, F. E. Moss, of Wigan	Chaplain.
,, Walter Whatmough, of Heywood	Treasurer.
,, R. G. Shadbolt, of Grantham	Secretary.
,, E. O. Watson, of Rawmarsh	Assistant Secretary.
,, J. W. Broadhead, of Elland	Director of Ceremonies.
,, S. Meunier, of Stockport	Assistant D.C.
,, J. Taylor, of Bolton	Senior Deacon.
,, T. Ousey, of Higher Broughton	Junior Deacon.
,, S. Shadbolt, of South Bank, S.O.	Organist.
,, R. H. Garlick, of Salford	Inner Guard.
,, Fred J. West, of Manchester	Almoner.
,, J. W. Scott, of Stockport	Charity Representative.
,, H. Butterworth, of Blackley ,, A. J. Harrison, of Padiham ,, M. L. Williams, of Stretford ,, H. G. Harrison, of Ashborne	Stewards.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Benevolent Fund of the Institution of Gas Engineers.

SIR,—In the reference to the report of the Committee of Management which you kindly make on p. 396 of your issue for May 23, £876 is given as the total income of the fund for last year—an obvious printer's error. The figure is £376.

I would take this opportunity of stating that the Committee of Management have issued a special appeal for help to meet the deficit of £63 which is mentioned in the report, and that the smallest contributions will be gratefully accepted.

W. T. DUNN, Hon. Secretary.

39, *Victoria Street, S.W.*,
May 25, 1916.

War Period Results and Rating Assessments.

SIR,—Basing my appeal upon the results of our past year's working, as compared with the results of the period upon which the previous rating assessments were based, I have been successful in obtaining satisfactory reduction. Possibly this may be of general interest.

Considerable work was necessary in this case, for special reasons which may not affect other undertakings whose assessments should be investigated. My efforts have been justified.

A. P. GHENT, Secretary.

Sittingbourne District Gas Company,
May 27, 1916.

Air Supply to Retort-Furnaces.

SIR,—Mr. Brooke's flight into the regions of theory on the above subject in your issue of May 9 [p. 284], plainly shows that he approaches the matter with a mind preoccupied with the importance of the invention of which he claims to be the patentee. But as the object of our opening the discussion is the necessity for automatic control, we maintain that the most important words in the whole of our letter are those your correspondent calls special attention to, "which might easily be overlooked."

He also qualifies his statement by bringing into the question conditions which now rarely apply, or, at any rate, are not permitted to apply by engineers of experience—viz.: "If the area and capacity of the producer are on the small side, and especially if it is fed at long intervals." No amount of automatic regulation either of primary air or chimney draught will compensate for deficiency in area of the grate or depth of fuel.

From practical experience, we also disagree with your correspondent in his statement that one chimney to each bed is the most favourable to chimney draught regulation; also that with chimney draught regulation reduction of the primary air supply will increase the vacuum on the top of the fire or at the entrance to the chimney. This is just what it prevents, and what automatic regulation of the air-inlets does not prevent.

We cannot follow his argument that a "chimney draught regulator, designed to maintain a constant pull, would proceed to reduce the pull." Surely, he would consider that such a regulator would not be one that is properly designed. But in any case, supposing such were to happen, his statement that "the proportions of primary and secondary air must vary considerably" is surely wrong, as, with a back-pressure which would thereby be caused in the setting, primary and secondary air would be equally retarded, assuming commencement was made with a clean fire; and one of the most frequent causes of the excessive formation of clinker is unchecked chimney draught. But in regard to his statement as to the number of works where this is being done "with good results," we think he should qualify this—from the number of places we have come across where this method has been tried and discarded. No doubt, they all count among the users, even if the regulators have been discarded.

In cases where the regenerators are old, your correspondent's remedy is to govern the primary air only; and we quite agree that the "life of the setting would be increased," we should say considerably, as, if the chimney draught was not kept under control, the immediate result (should the old regenerator be leaky—a common experience) would be trouble through short-circuiting, and the damage would take place in the regenerators, and the settings would very soon be unworkable—not through damage to them, but from lack of heat.

Your correspondent generously agrees that saving could be increased if the main damper is set periodically to a sensitive gauge to compensate for changes in the weather; and he expresses the belief that in such cases—*i.e.*, where the primary air inlets are governed—a suitable chimney draught regulator would have a good effect! This is putting the cart before the horse, with a vengeance.

We will not venture into the challenge as to our "utter lack of grasp of the principles governing the flow of gases through a retort-setting," beyond stating that to this, also, the old adage applies—"An ounce of practice is worth a pound of theory." It has been proved over and over again that a cutting draught at comparatively low temperature is far more destructive to brickwork than a higher temperature under pressure.

Your correspondent cites the first setting to be fitted with his regulators, as proof of his statement that the "velocity of the gases is slower, and the settings last much longer." If this is so, and we are right in assuming that this place is the one with which your correspondent has recently been associated, we are surprised at his mentioning it, as he knows that the regulators have been discarded after the experience obtained. We can only put it down to "difficulty found in adjusting the regulators at first." Perhaps the "variation of from 0·5-10ths to 3-10ths pull" was exceeded, as we have frequently found; but we have proved that the chimney draught regulator is quite capable of dealing with such large variations satisfactorily.

We hold the opinion that, while automatic chimney draught regulators are necessary to maintain constant conditions in the retort-settings, hand control for the chimney draught is preferable to automatic control on the air-inlets only, assuming the margin of chimney power is in excess of that required. Otherwise, neither automatic nor hand control is of much use anywhere; nor is there much fear of the overheating and resulting damage it is desired to avoid, which in practice takes place, though your correspondent denies it. But perhaps he will again look at our original letter, and notice that we do not state where! This depends entirely on where the secondary air that is necessary for combustion reaches it.

We prefer to avoid any multiplicity of dampers, as recommended by your correspondent, either for ordinary or clinkering purposes, which are unnecessary if the chimney draught is automatically controlled.

We are pleased to see that your correspondent "Carbonizer," in your issue of May 16 [p. 341], effectually disposes of certain of the arguments of Mr. Brooke. But we think he has been very fortunate in his experience of "obtaining uniform conditions at four different works for a long period without any alteration whatever," as, even with "attention given to feeding and clinkering the fires," we have often come across instances where frequent adjustments were necessary through the weather effect upon the chimney, owing to the peculiar situations.

For DRAKES LIMITED,
WILLIAM A. DRAKE, Managing-Director.

Halifax, May 26, 1916.

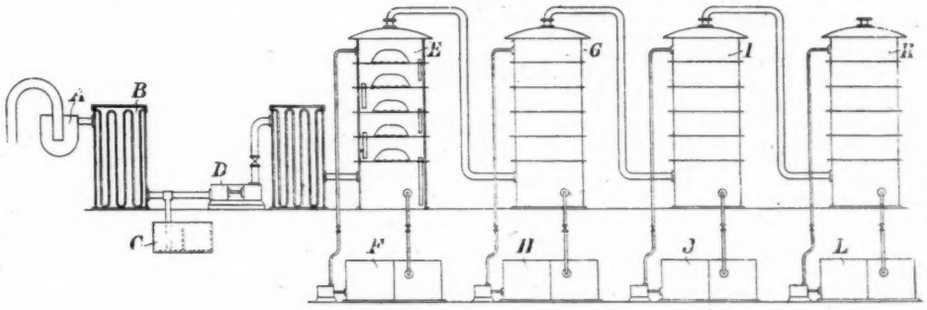
REGISTER OF PATENTS.

Purification of Coal Gas.

WILTON, G., of Mill Hill, N.W.

No. 4682; March 25, 1915.

This process for the purification of coal gas is one in which the gas is forced under pressure into contact with tar or liquor already condensed from the gas. The gases, as they issue from the retorts or hydraulic main, are subjected—together with some or all of the products condensed therefrom—to the effects of cooling, and to such pressure in contact with the products of condensation, tar or liquor (or both), that the liquor will absorb practically the whole of the ammonia, carbonic acid, and sulphuretted hydrogen, and the tar practically the whole of the benzol, carbon bisulphide, light hydrocarbons, and so forth, and thereby purify the gases—the gases being subsequently separated from the products of condensation, which are then released from pressure and can be dealt with in any suitable way.



Wilton's Gas Purification Process.

The gases, as they leave the hydraulic main A, are led through a condenser B of sufficient capacity to reduce the gases to atmospheric temperature; the resultant products of condensation being removed in the syphon C. The gases pass on through a pump D, by which they are forced into a sectional washer E at a pressure of (say) 30 lbs., and at a temperature of about 60° Fahr.—being cooled for this purpose. The tar and ammoniacal liquor which have resulted from the previous condensation of the gases are separated, and the ammoniacal liquor is led into the tank F, from which it is pumped into the upper part of the washer E, so that the liquor passes down through the apparatus and the gases pass up through the liquor in the opposite direction through the series of bubbling hoods. The liquor passes away from the base of the apparatus into the adjacent tank. The first washer E is supplied with a continuous stream of the virgin ammoniacal liquor (separated from the tar); the quantity being (for example) about 12 gallons per ton of coal carbonized. The patentee says he finds that in the first washer practically the whole of the ammonia is removed as bicarbonate in a highly concentrated state, as well as the cyanogen which combines with a portion of the ammonia—these products coming away in the ammoniacal liquor, from which they are removed in a suitable manner.

The gas is now led into the second washer G, into which the tar, previously separated as mentioned, is also led by being pumped into it from the tank H. The tar, of which about 10 gallons per ton of coal is available, is pumped through the washer, and flows in opposite directions to the gas. It is found that the tar will have absorbed the volatile hydrocarbons, including carbon bisulphide, benzol, toluene, &c., which can be removed by distilling the tar. As in the first apparatus, the tar is delivered into a tank adjacent.

The gas is next led into a third washer I, still being maintained at the 30 lbs. pressure, and through this washer water is pumped from a tank J; the water absorbing the greater portion, or practically the whole, of the remaining ammonia, carbonic acid, and some of the sulphuretted hydrogen. By adding sulphurous acid to the water in the third washer, practically the whole of the sulphuretted hydrogen may be removed and recovered in the form of sulphur, which will be precipatated into the adjacent tank, into which the wash water is discharged from the third washer.

A further washer K may be employed if required, through which wash-water from a tank L is fed by a pump and recovered in a tank attached to it. If required, metallic salts or oxides may be added to the last wash-water, or used separately, if desired, for removing the last traces of CO_2 and H_2S.

In another method of carrying out this invention, the hot gases as they issue from the retorts—say, at the outlet of the hydraulic main—may be pumped through a cooler, together with some, or all, of the products that have been previously condensed. The gas, together with the cooled products of condensation, are then pumped to a higher pressure—bringing the products and the gas into intimate contact, either by the centrifugal force of the pump or by bubbling with the condensed products in suitable apparatus. The pressure is then further increased by a third pump; the products of condensation following on with the gas, and being exposed to intimate contact—coolers being interposed to reduce the temperature to 60° Fahr. or less. The compression, cooling, and intimate contact will be further increased until a pressuse of two or more atmospheres has been reached. Under these conditions, the tar will have absorbed the carbon bisulphide and volatile hydrocarbons (such as benzol, &c.) to a considerable extent, and the water, which always occurs, will have absorbed the greater portion of the ammonia, carbonic acid, and sulphuretted hydrogen. To complete the purification it is only necessary to bring the gas, while still under pressure, into intimate contact with water, wherein the last traces of CO_2 and H_2S will be absorbed.

Manufacture of Oil Gas.

HOLLANDSCHE RESIDUGAS MAATSCHAPPIJ SYSTEEM RINCKER-WOLTER, of The Hague, Holland.

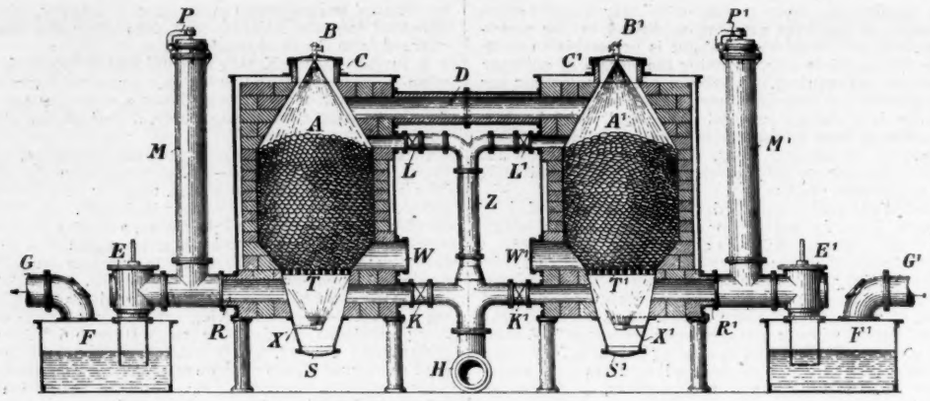
No. 6285; April 27, 1915. Convention date Feb. 24, 1915.

This invention consists in treating the residue of hydrocarbon bodies with hydrogen, or gases containing hydrogen, "whereby the residue is converted into hydrocarbons adapted to be gasified." Water gas is said to be the most convenient source of hydrogen for the purpose.

It might be supposed, the patentees remark, that the conditions indicated would exist in known plants for making ordinary carburetted water gas. This is not the case, however, because: (*a*) To make carburetted water gas one has to start with the manufacture of water gas—that is to say, with the decomposition of steam with formation of hydrogen and carbon monoxide. The mixture has then to be carburetted by passing through apparatus filled with fuel or fire-bricks, which are a little more than red hot; so that the water gas meets with an incoming stream of liquid hydrocarbon. The liquid hydrocarbon is vaporized and to some extent fixed in this apparatus and mingled with the water gas. The still unfixed gases are fixed in a third apparatus. (*b*) Contrary to this, the present invention does not start with water gas in proportion comparable with the known processes. This gas is manufactured in either of two generators, and is then caused to pass into another generator, where, however, it does not meet with an incoming stream of liquid hydrocarbon, but finds there the residues of the decomposed oil at the very moment they are being deposited. So, in tbe top of the second generator—instead of a decomposition, or a mingling liquid hydrocarbon with water gas—there is a combination, such as: $C_9H_{18} + H_2 = C_9H_{20}$.

In the process about to be described, hydrogen is introduced into the gasifier at the moment of decomposition, so that not only is a deposit of oil residues prevented, but the hydrogen is also admitted at the right temperature. This method is said to have the advantage that the direct gasification of parent materials containing heavy hydrocarbons—as, for example, oil, oil and petroleum residues, coal tar, and the like—in the generator is made possible, without the danger of clogging the oil or choking-up or other stoppages. In practice, instead of hydrogen, water gas is used—especially as the carbon monoxide, being an indifferent gas, has no action whatever on the process. The process is worked in two generators, which are used alternately for producing decomposed steam and oil gas. By this alternate working a maximum of gas can, it is claimed, be obtained from a minimum of material "in the most economical and rapid manner." Two generators used alternately for producing water gas and carburetting it were described in patents No. 940 of 1895 and No. 971 of 1891.

Apparatus for carrying out the process is shown in section on p. 462. A A^1 are the generators, lined with fire-proof material. B B^1 are spraying nozzles for introducing the liquid hydrocarbon for producing the oil gas. C C^1 are covers for closing the openings for charging the fuel. D is a pipe connecting the two generators. E E^1 are the gas-valves of the generators. F F^1 are water-seals for washing the gas, and also for preventing it from back-firing during the period when the



A Modified Rincker-Wolter Apparatus.

fuel is being heated in the generator. G G¹ are the gas-delivery pipes. H is the main air supply pipe. K K¹ and L L¹ are air-valves. M M¹ are flues for the products of combustion. P P¹ are valves on these pipes. R R¹ are passages in the structure of the generators for the gases developed. S S¹ are doors permitting the removal of the ashes dropping from the grates T T¹. W W¹ are doors for clinkering. X X¹ are steam admission ports, and Z is part of the air-main.

The apparatus works as follows: The generators are charged with fuel (generally to the level of the valves L), which is heated to the necessary temperature by a blast of air introduced at H. The air is divided and takes the following course. One part is introduced at the bottom of the generator, the glowing charge of which is to be brought to a higher temperature, passes through this charge, and is then conducted to the other generator, where it is admitted at the top and passes downwards. The other part of the air entering is introduced at the top of the second generator, with the double purpose of raising the temperature of the glowing charge and of burning to carbon dioxide the carbonic oxide formed in the first generator and carried over into the second. The air admitted at the top passes through the generator, and the products of combustion are conducted away from the bottom. When the desired temperature has been attained in the generator, the liquid hydrocarbon is introduced at the top of the generator in the form of vapour. As soon as this comes into contact with the glowing charge in the generator, it is at once decomposed; and the gas evolved passes downwards, owing to its own expansion or to applied suction, and leaves the generator at the bottom. Simultaneously with the admission of oil at the top of one generator, steam is admitted at the bottom of the other. The decomposed steam rises in this generator, while the oil gas produced in the other passes downwards. The decomposed steam passes from the generator in which it has been produced into the other generator, containing the oil, just at the moment when the latter is decomposed, at which moment the gas evolved from the oil passes off from the bottom part of the generator. The hydrogen of the decomposed steam acts on the residue of the decomposed oil, and forms a fresh paraffin, which, in its turn, is vaporized, decomposed, and converted into oil gas.

The present invention therefore is a continuous process—since during the conversion of the unsaturated hydrocarbon compounds into saturated compounds, independently of the latter, fresh quantities of oil are admitted to the generator and are subjected to the aforesaid decomposition, and saturation by means of hydrogen.

Intermediate Products from Hydrocarbon and Other Distillates.

LEWIS, G. P., of Brixton Road, S.W.

No. 6450; April 30, 1915.

The patentee claims to have found that comparatively small quantities of the distillates from certain solid carbonaceous materials, when brought into contact with hydrocarbons, preferably at a high temperature, react upon the latter in such a way as to make their constituent parts more readily dissociable, and, therefore, more readily utilizable for the manufacture of other materials.

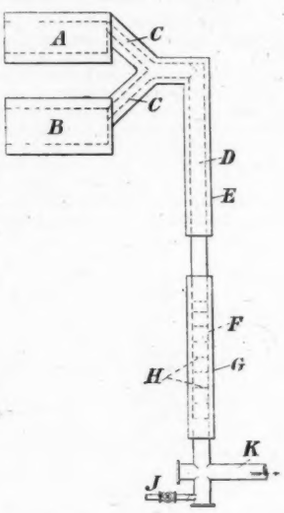
In the preferred method of carrying out the process, the solid carbonaceous material is placed in a retort and heated to a temperature sufficient to vaporize its volatile constituents, and the tar, hydrocarbon, oil, or the like is heated in a second retort, and the hot gaseous distillates well mixed in a suitable mixing-chamber, preferably kept at a high and even temperature—as, for instance, by a steam-jacket. The mixing-chamber is preferably kept at such a temperature—say about 300° C., according to the boiling-point of the hydrocarbon—that the bulk of the contents remain in the gaseous condition. The resultant product is then condensed, and forms the intermediate product, which is the object of the invention.

The illustration shows diagrammatically one type of apparatus suitable for carrying out the process.

A is a retort or vaporizer for the hydrocarbon; and B is a retort for the destructive distillation of the solid carbonaceous material. The hot volatile products from both retorts are led to a mixing-chamber D by pipes C—all of which are preferably kept hot by means of a steam-jacket E. The hot gases are then passed to a condenser F, surrounded by a jacket G, through which cold water, brine, or the like is passed, and provided internally with baffles H. The condensate passes by the pipe J, and any uncondensed gas passes away by the pipe K to a suitable holder.

According to another arrangement, the gaseous distillate from the solid carbonaceous materials may be brought into contact with the hydrocarbon in the liquid form, by passing it through a gas-works tower scrubber fitted with plant for distributing it over the scrubber-filling material, or it may be passed through a rotary scrubber charged with liquid hydrocarbon.

It is impossible at present to say, the patentee remarks, what is the character of the reaction (or series of reactions) which takes place when the distillates from the solid materials are mixed with the hydrocarbons; but, as an example, he states that 4 lbs. of a hydrocarbon in the form of a coal-tar fraction boiling at from 250° to 300° C, after treatment with 1 lb. of the distillate from an Australian brown coal



Lewis's Plant for Preparing Intermediate Products from Hydrocarbons.

gave a resultant distillate containing 55 per cent. of oils boiling below 250° C.; and of these oils only 15 per cent. was directly due to oils in the distillate from the solid material—the remaining 40 per cent. being estimated as due to changes in the condition of the hydrocarbon brought about by the action on it of the distillate from the brown coal. According to another example, 6½ lbs. of a hydrocarbon, also in the form of a coal-tar fraction boiling at from 250° to 300° C., was treated with a quantity of gases distilled from an Australian brown coal, containing 1 lb. of condensable hydrocarbons, and gave a resultant distillate containing 63 per cent. of oils boiling below 260° C.

Gas and Air Mixing Valve.

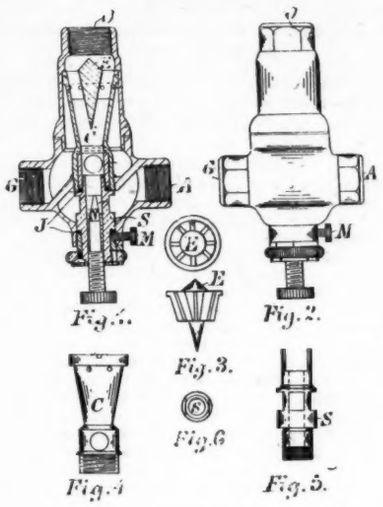
HALKETT, R., of Glasgow.

No. 6509; May 1, 1915.

This invention relates to a mixing valve for use more particularly when the gas and air are supplied under pressure; the object being to construct a mixer injector gas and air valve, wherein a minimum supply of gas and air is given when the device is placed in the "off" position—the supply from minimum to maximum being controlled by the opening of the air and main gas-ports, all so arranged that the exterior or supply taps remain always fully open. The mixing apparatus can only be cut off by the shutting off of the cocks or valves on the main supply pipes—the air-ports for a minimum consumption being never fully closed, while subsidiary gas-ports provide a correct minimum flow of gas through the valve.

In the arrangement shown on p. 463, the valve body has air inlets A to one part of the valve, and gas-inlets G to another part, with outlets O to connect to the burners or furnace. Taking, as an example, a valve with a single air entrance A, and a single gas entrance G, with air at a pressure of (say) 2 lbs. per square inch, the air will pass into the valve body through A, which has no direct communication with G, and then through holes formed in the sleeve valve S, which also acts as an injector, and sets up an injective force at the holes through which the gas passes from G, so that a proportionate mixture is created.

This mixture passes through the chamber C, which is divided by a section-piece (shown in fig. 3) comprising a depending pointed central member E and ribs with or without a surrounding flange—the section piece being fitted or dropped into position in the chamber. This device is for the purpose of assisting to form a more intimate mixture of the gas and air. For each section formed in the mixing-chamber there will be a gas inlet, so as to ensure that no free air passes on to



Halkett's Gas and Air Mixing Valve.

the outlet O, where the gas and air are finally intermixed. The sleeve valve S (shown in more detail in figs. 5 and 6) provides means for setting the mixture for any desired consumption. It is furnished with ports through which the air may flow into the hollow interior, and a milled head so that the sleeve may be turned. A check pin (fig. 1) is provided to govern the amount of rotation given to the valve when setting it.

Working in the lower portion of the valve is a needle point N (fig. 1) with a milled head (figs. 1 and 2), and in proportion to the movement of the needle point, the area of the injector is reduced, as also the volume of air, depending on the amount of reduction in the interior of the sleeve S by the obstruction of the needle point. As a precaution against leakage of air past the sides of the sleeve, washers J may be employed, as shown in fig. 1. In order to permanently set the gas and air proportions when the apparatus has been adjusted, a set-pin M and back-nut are employed.

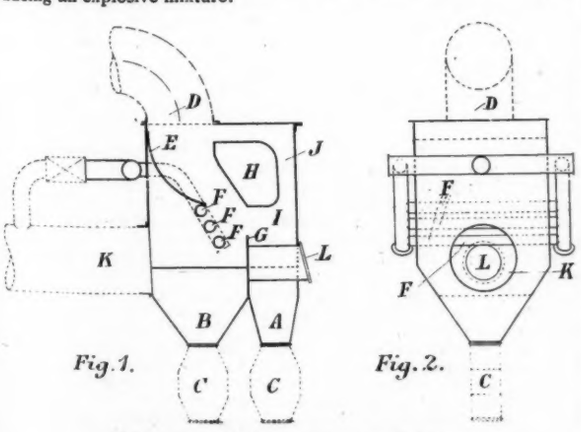
To set the mixer for any desired consumption, the milled head is turned as far as its check pin will permit; thus entirely closing the port-holes. The upper blanks of the sleeve cover the holes. The needle point N is then moved up till it is checked; and this will leave an area sufficient to pass air through the ports to mix with the gas entering each of the sections in the mixing-chamber C. This gives a minimum consumption. To increase the consumption the process is reversed; and the ports opened.

Removing Solid or Liquid Matters from Gas.

FISHER, J., of Wood Green, and FIDDES, W. J., of Tottenham.

No. 9911; July 7, 1915.

This invention is particularly designed for use in extracting dust from producer gas, water gas, and the effluent air from sand-blasting appliances—dispensing with the use of water or other liquid for the purpose as commonly employed, and thus avoiding the dilution or impregnation of the gas as cleansed with any foreign gas or air, or producing an explosive mixture.



Fisher and Fiddes' Dust Filter for Gas Plant.

The patentees propose to provide an air-tight casing into, and from, which is passed the stream of gas to be cleaned; and they pass through the stream of gas or air at any desired angle a jet or jets, or film or films, of previously cleansed gas when cleaning gas (or air when cleaning air) in either the same direction or a different direction to the main stream, and at a greater pressure than the main stream. All dust or dirt and any watery or moist particles are thus deflected from the main stream, which passes away thoroughly cleansed.

The illustration shows in fig. 1 a sectional side elevation on the centre line of fig. 2, which is an elevation looking towards the gas outlet.

The arrangement comprises a gas-tight casing of a shape suitable for deflecting the incoming gas as may be desired. The casing is provided with suitable chambers A B for receiving, and means, such as removable receptacles C, for removing, the dust or moist particles. The gas may enter the chamber from the top at D, the side, or the bottom, according to circumstances. If it enters from the top or bottom, it is deflected by a plate E in a horizontal direction while passing through the chamber; if entering horizontally, it would be deflected upwards or downwards to suit the circumstances of the plant where it is employed.

While the gas is travelling in the required direction, jets or films of previously cleaned gas, from nozzles or holes in the tubes F, are caused to pass through the main stream of gas at a greater pressure; and in so doing they carry all dust or moist particles from the main stream—the orifices of the tubes F being preferably positioned at a point where the main stream of gas is being deflected. There is in the chamber a division plate G and a tube or filling H fitted across the chamber with an aperture I between the division plate and tube through which the dust or moist particles are projected by the jets or films. The space between the division plate G and the wall of the chamber is utilized for the reception of the dust or moist particles, which fall into the chamber A and receptacle C attached to it, and can be removed at intervals; the chamber B and receptacle C collecting and retaining any surplus dirt or moist particles falling. There is a further connection between this dust chamber and the inlet by means of a passage J, by means of which the excess of gas used in the process is returned to the incoming stream.

The main stream of gas, having been deflected and cleaned as described, can de taken away in any desired direction by the outlet K, and suitable chambers can be constructed to meet all requirements. For large sizes, these chambers would preferably be constructed of steel; and, in the case of dealing with hot gases, they would be lined with fire-brick and fitted with ducts, also formed of fire-clay material. When employed for cleaning producer or other inflammable gas, explosion doors L can be fitted opposite the outlet pipes, or as required.

Gas-Fires.

ROGERS, R. J., and CADWALLADER, W. E., of Birmingham.

No. 10,285; July 15, 1915.

This invention relates to gas-fires of the central heating type, comprising radiants disposed around a central body of fire-brick or other refractory material, of circular, square, triangular, or polygonal section as desired, "so that the radiant heat is uniformly distributed to all parts of the room."

The principal object of the invention is to enclose the burner and base of the gas-fire by a fender which is capable of being readily detached or disassembled in order to obtain access to the burner for cleaning or adjustment, or for the replacement of parts of the burner; while other objects are to prevent dust or dirt from being drawn into the burner with the air supply, and to admit of the burner being easily removed for cleaning or other purposes.

The fender is made in two or more readily detachable sections secured in position, and the air openings for the admission of the primary air are made in the fender at or near the top of it, instead of near the floor as usual; so that no dust or dirt can be drawn into the burner. The burner is of circular form, in two or more sections, removably supported upon suitable rests on the base frame of the structure. They can then be easily taken out for cleaning or adjustment, while, by means of a suitable tap, each section can be used independently, or both or all sections used together.

Increase in Price at Barnstaple.—The Barnstaple Gas Company have given notice of an increase of 4d. per 1000 cubic feet in the price of gas, as from June 1. The present price is 3s. 8d. per 1000 feet.

Nuneaton Gas Company.—The accounts adopted at the annual meeting of the Company showed that the net profit for the year was £3281, which, with the balance brought forward from the previous year, made a total of £9843 available. From this, interim dividends had been paid of 7½ per cent. on the original shares, and 5¼ per cent. on the new shares. This absorbed £1315. The Directors recommended that further dividends, similar in amount, be paid, on both classes of shares, making the total dividends paid £2630. The report stated that, in spite of the war, the manufacture and sale of gas continued with satisfactory results; and the works, &c., had been well-maintained out of revenue.

Bideford Gas Company.—Mr. F. A. Searle, presiding at the annual meeting of the Company, remarked that the quantity of gas manufactured, 58,000,000 cubic feet, showed a reduction of about 750,000 feet on the previous year. There had been an increase in the cost of coal of 6s. per ton, exclusive of freight, which had been more than double. The result was that the cost of manufacture was £7722, against £6679. Receipts for public lighting fell off by £100; but from private consumers they received £7478, against £6573—the increase being due to the advance in the price of gas. It was decided to pay dividends of 12 per cent. and 9 per cent. on the two classes of shares, as compared with 13½ per cent. and 10½ per cent. last year. Mr. W. D. Joce, the Secretary, referring to a complaint respecting the low stock of coal, which necessitated borrowing from neighbouring companies and drawing upon the stocks of local merchants, said cargoes had been held up by the Naval authorities and deliveries were very irregular. Consumers must be prepared for substantial increases in the prices of gas and coke.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:

Bills reported, with amendments: Colchester Gas, Ferndale Gas, Hornsey Gas, South Metropolitan Gas.
Bill read a second time and committed: Folkestone Gas.
Bill read the third time and passed: Aberdare and Aberaman Gas.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bill read the first time and referred to the Examiners: Aberdare and Aberaman Gas [Lords].
Bill reported: Local Government (Ireland) Provisional Order (Gas).

The Aberdare District Council have presented a petition against the Aberdare and Aberaman Gas Bill.

Local Government Provisional Orders (No. 7) Bill.

A Bill to confirm certain Provisional Orders of the Local Government Board relating to Westhoughton and the Swinton and Mexborough Gas Board was presented last Tuesday by Mr. Hayes Fisher, read the first time, and referred to the Examiners.

CHARING CROSS BRIDGE ALTERATIONS.

Effect on Gas Companies' River Traffic.

The Marquis of Bristol's Committee completed the consideration of the South-Eastern and Chatham Railway Bill last Wednesday, after a hearing lasting five days. The main facts relating to the proposal were given in last week's "JOURNAL" (p. 401).

Mr. G. J. TALBOT was assisted, on behalf of the three Gas Companies opposing, by Mr. A. D. BATESON, K.C.

The committee room was more than usually interesting, for the Gas Companies had filled all the available space with a large model of the Thames between Blackfriars and Westminster Bridges, including models of Waterloo and Charing Cross Bridges, as well as a model of the "Mitcham" and "Wandle" types of vessels. In another committee room was a larger-scale model of the Charing Cross Bridge as it is proposed to be altered. On Thursday, the Committee and the parties spent a good deal of time round the latter; the Marquis of Bristol's experience as a sailor enabling him to deal with the evidence of the Masters of the Wandsworth Company's boats in quite a professional way.

The evidence of Captains Lockee and Mastin was that the headway—viz., 25 feet above Trinity high-water mark—under Charing Cross Bridge as altered would be sufficient, and was not the point of the opposition. The argument was that, owing to the short distance between Waterloo and Charing Cross Bridges, the bend of the river at this point, and the offset of the current, it was necessary always for their coal-vessels to take Charing Cross Bridge athwart, and not straight. Thus the reduction of the width of the arches by the addition of the cantilevers would render the danger of hitting the sides of the arches much greater than at present. In this view, Commander Caborne, R.N., Nautical Assessor to the Privy Council, concurred, after an actual trip in one of the vessels.

The Railway Company's case, on the other hand, was that observation had been kept on the two Masters of the Wandsworth Gas Company's vessels for two months, and on every occasion they had been able to clear the sides of the arches by over 40 feet. Thus the slight reduction of the available space entailed by the alteration would not affect the navigation of the river from the Gas Company's point of view.

The Gas Companies also called as witnesses Mr. Hall Blyth and Sir Maurice Fitzmaurice, two civil engineers of great experience, who contended that, with a view to avoiding the makeshift scheme proposed, it would be possible to remove the whole of the existing superstructure and construct a new one of nickel steel on the existing pillars of a strength sufficient to carry the traffic required with a weight of bridge, in consequence of the use of nickel steel, of 40 per cent. less than the present one. The cost of such a bridge would also, it was said, be £60,000 to £70,000 less than the proposal of the Railway Company.

Mr. H. O. Carr, the Engineer to the Wandsworth Gas Company, also gave evidence, and pointed out how serious would be the effect on the price of gas if the Company's large vessels were prevented from getting up the river, and the coal had to be transferred to lighters.

The Committee, however, decided to pass the Bill.

Public Lighting at Tottenham.—The Tottenham District Light, Heat, and Power Company have written to the District Council stating that they are proceeding to put certain lamps entirely out of lighting until they receive instructions to the contrary. The Company point out that this will inflict a further loss upon them, as the amount they have been receiving for standing charges on these lamps helped to reduce the loss they were making on the remainder which were in lighting. They mention that the cancellation of the lamps does not reduce labour costs in the least, because, though their number is considerable, they are dotted about the district in such a way that the attendant's rounds are not reduced. The Company therefore asked the Council to consider the payment to them of an increased price in respect of the lamps remaining in lighting under the contract. The General Purposes Committee, to whose consideration the letter was referred, report that they are unable to agree to the Company's suggestion, and recommend the Council to inform the Company accordingly.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, May 25.

(*Before the* LORD CHIEF JUSTICE, *Lord Justice* WARRINGTON, *and Mr. Justice* SCRUTTON.)

Leiston Gas Company, Limited, v. Leiston-cum-Sizewell Urban District Council.

This was an appeal by the defendants from the judgment of Mr. Justice Low of Feb. 1, and raised a question of considerable importance to gas companies, and local authorities employing gas companies to supply public gas lighting.*

Mr. HAWKE, K.C., and Mr. POYSER appeared for the appellants; Mr. J. B. MATTHEWS, K.C., and Mr. R. GODDARD for respondents.

Mr. HAWKE said the action was brought to recover £157 15s. 9d. for services rendered to the defendants in the lighting of certain gas-lamps pursuant to a written agreement; and the defence was that as they had not had the public lighting they ought not to pay. The case was tried on admitted facts as to the number of lamps lighted, the number of days, that no order to discontinue lighting was given by defendants, but that the lighting was discontinued in consequence of an order by a competent authority acting under the Defence of the Realm Act. Plaintiffs, having to supply public illumination, did so for a few days in one quarter, and in two ensuing quarters none at all. The learned Judge had held that defendants were bound to pay for all three quarters. It was against this decision that the appeal was brought. Defendants' contention was that the contract was for public lighting; that plaintiffs had not lighted, and consequently could not recover; and, further, that the contract for illumination had become illegal and put an end to, or, at any rate, suspended the contract, and therefore defendants were not liable to pay. Defendants could not demand that plaintiffs should light the lamps, although they had contracted to do so; and therefore they could not be called upon to pay. The view taken by the learned Judge was that the contract was not one for illumination, but for the erection of lamp standards also; and therefore defendants were bound to pay. He also took the view that the emergency regulations, under which the lighting was stopped, were only temporary; and then he went on to draw the conclusion that it did not matter how long the actual stoppage was for, and that the contract was not unlawful or improper; and he also took the view that the contract had been partially executed. His (Mr. Hawke's) submission was that the basis of the contract was one for illumination; that this illumination had not been given; and if plaintiffs excused themselves by saying it became unlawful for them to illuminate, that also excused the defendants from payment. What the defendants contracted for was illumination; and although the contract required the Gas Company to put up lamp-standards with which to illuminate, defendants did not contract to have standards—they merely contracted to erect standards for the purpose of lighting. By the agreement of June 2, 1911, it was provided between the parties that the contract should be for five years from Aug. 1, 1911; that the Gas Company should provide 105 columns, lanterns, and inverted incandescent burners, complete with automatic lighters; and should connect the same with their mains—the whole of the plant remaining the property of the Company, who were to purchase from the Council their existing stock of lanterns. The Company were to supply gas, light, extinguish, clean, repair, paint, and maintain the lamps—including the provision of incandescent mantles and chimneys; the period of lighting to be so many hours per day, and the lamps were to be lighted when the moon was obscured. The Company undertook to provide by means of incandescent burners an effective candle power of not less than 60 sperm candles per burner; and the Council were to pay £1 17s. 6d. per lamp per annum for each of the 101 lamps, and £3 7s. 6d. on four lamps burning all night. Clause 10 of the agreement provided that, if the Company failed to light any of the lamps, they should—unless the failure was due to causes beyond their control, or to payment being in arrear—forfeit and pay 6d. per lamp per night. But plaintiffs did not really rely on this clause. Under the agreement, defendants went on paying for the gas up to 1915; then there was obscuration, and on Jan. 26 extinction; and from that time defendants took the view that they were not liable to pay, as it was substantially a contract for lighting and not a contract for the supply of lamp-standards.

Mr. Justice SCRUTTON said if the contract could be suspended and revived, where was the illegality?

Mr. HAWKE said his contention was that the contract was at an end, as it was a contract for lighting lamps, which plaintiffs had to light and keep burning at a certain standard of illumination, and they had not done so.

Mr. Justice SCRUTTON: You put that on the idea that the existing state of the law as to lighting will continue.

Mr. HAWKE: That is one of the grounds on which I can put it. All I say is you have not supplied me with what you contracted to do.

The LORD CHIEF JUSTICE: Plaintiffs say they are ready and willing to supply, but that they are not allowed by law to do so.

Mr. HAWKE: If all the defendants have agreed to pay for is illumination, they have not got what they contracted for, and it does not matter whose fault it is that prevents the contract being carried out. Where the difference made by the embargo was substantial and operated in making a new contract, then the illegality put an end to the contract altogether. Having read the judgment of Mr. Justice Low, the learned Counsel cited several authorities in support of his contention.

Lord Justice WARRINGTON asked whether defendants could have sued the Gas Company for not lighting the lamps.

Mr. HAWKE thought not, as they would have the good excuse that it would be illegal to do so.

The LORD CHIEF JUSTICE: Suppose there was an interruption of the contract for a week, owing to the action of the State, would it follow that the contract was at an end?

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* See "JOURNAL," Vol. CXXXIII., pp. 211, 314.

Mr. HAWKE: I should not like to say that it was at an end.

Mr. MATTHEWS said there was clear authority that the contract was not put an end to.

Mr. HAWKE said that so far as the three quarters were concerned, the plaintiffs could not recover as they had not performed the agreed services; and so far as the whole contract was concerned, it was a frustration of the commercial venture between the parties.

Mr. MATTHEWS said there was an essential distinction to be drawn between total failure of consideration and partial failure of the entire consideration; and his submission was that the doctrine of frustration of an adventure had no reference to agreements like the present one. There was no rescission; for it was not until two quarters had elapsed that defendants took up the position that the contract was at an end. If one party conceived that the time which had elapsed was so long as to have defeated the agreement, he might at his election rescind, and as from that time put an end to further payments. Defendants not having rescinded, but having kept the contract open, were bound to pay, as was decided by the case of *Loates v. Maple*. Plaintiffs were bound to keep their plant in such a state as to be ready to resume the lighting when thee mbargo on lighting was removed. Also the cost of erecting the standards had been incurred; and they were entitled to get a return on their outlay. For a long time the position taken up by the defendants was simply that of suspension; and it was not till Sept. 16 they put forward the view that the agreement was at an end.

Friday, May 26.

Mr. MATTHEWS contended that the contract not having been rescinded, the plaintiffs were entitled to payment. If the day after the total restriction of light came into force the Company had said there was an end of the lighting, and had proceeded to remove the standards, the Council would immediately have applied for an injunction to restrain the removal. The total performance of the contract had not been rendered impossible.

The LORD CHIEF JUSTICE: You say, in any event, it was not open to you to put an end to the contract in consequence of the regulations made under the Defence of the Realm Act. Supposing the Council had said we prefer to keep the contract going although we do not get the benefit of the gas, your contention is that the contract was not at an end; and, as notice of rescission had not been given, the Council must pay.

Mr. MATTHEWS said that was his contention; that plaintiffs had a vested right of action immediately the March quarter's rent became payable. Had the Company removed the standards, the Council would have had to pay a considerable sum for the lamps to be reconnected with the mains; and therefore they preferred to treat the contract as subsisting.

The LORD CHIEF JUSTICE: You say the Council have never elected to determine the contract; and in the meanwhile you have been keeping the standards there in the belief that the contract was subsisting.

Mr. MATTHEWS said that was so.

Mr. HAWKE observed that the case in the Court below was tried on admitted facts; and there was nothing in them about "standing by."

Mr. MATTHEWS: It is not my intention to travel outside the admitted facts.

Mr. Justice SCRUTTON said the contention of the Council was that before they could be called upon to pay, the Company must have performed their part of the contract.

Mr. MATTHEWS replied that if the Company by default had failed to do that which they had covenanted to do, the point would be a good one; but by the act of the law (or of the Executive) he was excused and prevented from suffering exactly as the law applying to restraint of Princes would excuse a shipowner. The Council were not excused from performing their part of the contract unless they showed that there had been a total failure on the part of the Company, which had not been proved. If the complaint was that there had been a short supply of gas then the remedy was an action to recover damages.

Lord Justice WARRINGTON: Where the non-supply of gas is set up as a defence to the action, does it make any difference that you have been restrained by the regulations under the Defence of the Realm Act?

Mr. MATTHEWS: If a Zeppelin had dropped a bomb on the gas-works, and put the works out of action for a short time, the remedy would be damages.

Mr. Justice SCRUTTON did not think the Company would be liable for damages in such a case.

Mr. MATTHEWS said if the action was to recover money due, it would be no defence to say, You have not supplied the gas.

Lord Justice WARRINGTON: Why not?

Mr. MATTHEWS: Because the sum I am suing for is not a payment for goods sold and delivered, but a payment to be made in exchange for three distinct things which I have undertaken to do.

Lord Justice WARRINGTON: One of which you do not do.

Mr. MATTHEWS said the measure of damage would be something quite apart from the stipulated sum—such, for instance, as the cost of providing oil-lamps. The contract was to provide the capital to instal the plant, to provide gas, and maintain the lighting; and in consideration of the combined service he was entitled to the amount due under the contract. The action was not for gas supplied, but in respect of the combined service.

Mr. GODDARD followed on the same side, and put the case of the gas-main being broken by a steam-roller passing over it, with the result that gas could not be supplied for one month out of the quarter. According to the authorities, the Council would have to pay according to their covenant, and recover damages for such part of the time as they were deprived of the light. In considering where the loss must fall, it was material to remember that where people made a contract of this kind which was to be paid for by a flat-rate, they must always contemplate that something would happen which would prevent the full advantage being derived. The Council could have made a contract to pay for the gas according to the meter registration, and the installation at contract prices; but they had not done so. They chose to enter into a contract to reimburse the Company by payment of a flat-rate. The Council could not repudiate the contract because something had happened which made it the worse for them. Had something happened which made it worse for the Company, they could not have complained, and they would have had to keep to the flat-rate too.

Mr. HAWKE, in reply, said what the Council had in substance agreed to pay for was illumination which they had not had.

The LORD CHIEF JUSTICE asked if Leiston was still in darkness.

Mr. MATTHEWS replied in the affirmative, and said the Council had recently given notice to determine the contract; and he believed that they intended to light the town with oil-lamps.

Mr. HAWKE said, if the contract was for illumination, then the whole thing had become illegal, and it was for the Court to find out what the basis of the contract was. The illegality of the performance of the contract by the Company discharged the Council from liability.

At the conclusion of the arguments, their Lordships said they would take time to consider their judgment.

COMPENSATION FOR A GAS EXPLOSION.

In the Bow County Court, on Monday of last week, before his Honour Judge Graham, K.C., Thomas Gallagher was the defendant in an application under the Workmen's Compensation Act by the Manchester Liners, Limited, of Limehouse. Mr. Duckworth appeared for the applicants, and said that in 1907, when Gallagher was a workman in their employ, there was a gas explosion, as a result of which the man was thrown on his head. He had been gradually getting worse since that time; and Sir John Collie, M.D., had now decided that he would never be able to work again. There was no doubt that the shock of the gas explosion had completely shattered his nerves. Liability had always been admitted; and he had been paid £1 a week since the explosion—some £450. It was now desired to terminate these weekly payments by giving him a lump sum. This had been calculated on the basis of the man being 53 years of age; and an offer of £502 9s. had been made to him, which he had refused, as he wanted £700. He declared his age to be only 42; but after searching various records they made him 53 years old. Defendant still insisted that he was only 42 years old; but Judge Graham said he was satisfied the proper age was 53, and awarded £502 9s. On the application of Mr. Duckworth, he granted the applicants all the costs incurred, on the highest scale, against Gallagher, as he was the whole cause of the proceedings.

Damaging a Prepayment Meter.

Last Thursday a man employed at a Sheffield ganister works was charged at Chesterfield in respect of 11s. 6d. owing for gas to the Gas and Water Board, and also that he, "by culpable negligence, did suffer a gas-meter to be damaged." Defendant was formerly the tenant of a house in Derby Road, Chesterfield, and as the collector for the Board was unable to gain admittance on several days, he visited the house with the landlord's agent, and the door was forced. The prepayment meter was found to be badly damaged; the index having been pushed inside, and the lock of the cash-box wrenched off. There was no money in the box, although the register showed that the box should have contained 11s. 6d. An order for the payment of 11s. 6d. for gas consumed was made; and defendant was also mulcted in 25s. damage to the meter, and 20s. costs.

Damages for Gas Poisoning.

In the Shoreditch County Court last Thursday, before his Honour Judge Graham, K.C., the hearing was concluded of an action in which Jane Couzens, an infant, asked for £15 damages under the Employers' Liability Act from Messrs. P. Yanover and Co., of Hackney Road, N.E. It appeared that the girl was employed in the factory, where it was part of her work to use a bunsen burner, which was connected with the gas-bracket by a rubber tube. From time to time this tube became disconnected, when the manager would put things right for her, always turning off the gas before doing so. On the day of the accident, the tube had come off, and the manager had attended to it; but soon after he was called away. A moment or two later, the tube came off again; and the gas escaped. Plaintiff was standing right over it; and before she could call out to raise an alarm, she had been overcome by the gas, and sank to the floor unconscious. She swooned several times, and afterwards said she would try and go on with her work, but found it impossible, and had to go home. She had ever since been suffering from gas poisoning and bronchial catarrh set up by it. The defence was that the girl had been suffering for some time from indigestion, and on the day in question had a more than usually severe attack. It was true the rubber tube came off; but it was submitted that the gas could not have had the results alleged. It was well known that, with coal gas, it took some time for the effects to be felt. It was denied that the gas-tube was a source of danger, as, if anything had been needed to put it right, it would have been done at once. A case of a girl being instantly overcome by inhaling ordinary coal-gas fumes was really unknown. Judge Graham awarded the plaintiff £12 damages, with costs on the "B" scale.

Suicides by Gas.—A Haywards Heath photographer, named Tugwell, who could not make his business pay, owing to the war, committed suicide in his dark-room by means of a tube attached to a gas-bracket. The Coroner (Mr. G. V. Benson) said it was very sad that men should yield to the temptation to get rid of their own troubles in this way, and pass them on to others to bear. William James, a Maesteg grocer, while ill, also killed himself by turning on the un lighted gas in his bedroom.

Painting of Gas-Lamp Columns.—The Gas Light and Coke Company have offered the Willesden Urban District Council an allowance of £101, in the event of their agreeing to forego the painting of the street-lamps and columns this year. The Council are recommended to adopt this course. The Wandsworth Borough Council are recommended to inform the gas companies concerned that they concur in the proposal that the street-lamps should not be painted this year, subject to a satisfactory allowance being made them.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary Meeting of the Association was held last Wednesday, at the Cannon Street Hotel, E.C.—Sir CHARLES J. JESSEL, Bart., in the chair.

The SECRETARY (Mr. R. W. Wilson) read the notice convening the meeting.

THE LATE SIR CORBET WOODALL.

The CHAIRMAN: Ladies and gentlemen, I rise to move—"That the common seal be affixed to the register of proprietors." Our meeting here to day, under any circumstances, would not have been perhaps of a cheerful character; and therefore it is with the more regret that what few observations I have to make to you commence in a somewhat doleful key. You are all, or probably most of you are, aware of the great loss occasioned to this Association, and to the Board of Directors, by the death last week of our loved and respected colleague, Sir Corbet Woodall. In the dim and dark ages before I joined this Board, Sir Corbet Woodall was on several occasions consulted by the Association; and it was on the 1st of June, 1891—very nearly a quarter of a century ago—that Sir Corbet first took up the post of Consulting and Travelling Engineer to the Association. In that post, he rendered to the Association most valuable and enduring service; and in October, 1902, he was elected to the Board of Directors. It would be an impertinence on my part to attempt to assess his value as a gas engineer. I can safely leave that to the "great guns" of his own profession; and I have no doubt, in due course, the Goddards, the Carpenters, the Jones's, and others will give voice to what the profession, with us, has lost by the death of Sir Corbet. I can only speak of the personal loss that my colleagues and myself feel by his death. I can naturally claim, through having seen Sir Corbet nearly every week for twenty years, some personal knowledge of him and of his character. I have known a few equally well bred; a few equally well endowed with scientific attainments; a few equally equipped in the way of intellectual competence; but few—very few indeed—with his sympathetic charm of manner; and I have known none graced with these virtues in so agreeable a blend. [Hear, hear.] If I had to write Sir Corbet's epitaph, I should say: "He was a great English gentlemen," because I always felt that, in the many discussions and deliberations that took place at Boards where I met him, whatever happened, his point of view on any subjects that arose would be that of a true English gentleman. I am sure—I feel almost sure—that he had no enemy. If such an one exists, I am glad to think he is not of my acquaintance.

THE NATION'S CALL.

Of our other Directors who are not here, there is Colonel H. Le Roy Lewis, who is now permanently military attaché at Paris, and is doing undoubted good work there, recognized by the French Government by the bestowal of a high French decoration. There is Mr. Palmer, now a 2nd Lieutenant in the Royal Engineers. He has written to us from the front asking to be excused from being present to-day; and Lord Gorell is still at the front in command of his battery of artillery.

A LITTLE INFORMATION FROM BERLIN.

Well, ladies and gentlemen, what I have to say to-day with respect to our position is but little enough; but I may claim that that little in some degree is not altogether unsatisfactory. I will first of all treat of Berlin; and, perhaps, as some of our proprietors are somewhat uncertain as to what Berlin means, I may as well explain that, in Greater Berlin, there are two municipalities—Charlottenburg and Neukölln—who possess their own gas-works. Of the rest of Greater Berlin, two-thirds of the output of gas is made by the Municipality of Berlin; and the other one-third by the Imperial Continental Gas Association. The most interesting thing that has happened there (and here I may say that we have not been in any way informed officially of this piece of news, but have only been able to gather it from a perusal of the German newspapers) is that the Municipality of Berlin have raised the price of gas to 16 pfennig per cubic metre. I will translate this broadly by saying that it means about 1s. per 1000 cubic feet, or a rise on the former price of about 25 per cent. We learn, also, from the newspapers that the so-called English Company—that is to say, the Imperial Continental Gas Association—have not raised their price. As to what profit we are making, I need hardly say we receive no balance-sheet, and have no knowledge as to what is really occurring. All we do know is that what we have received in the shape of news through Holland is that, in the month of March last, the total net cost to us of gas had increased by 7¼d. per 1000 cubic feet, compared with March 1914. This is all the news I can give you respecting Berlin.

INTERNMENTS.

One of our staff, Mr. Williams, who was shut up in Ruhleben in November, 1914, was released in December, 1915, and has come back to this country. We have also heard that Mr. William Wilson, the son of our esteemed Secretary, who was on the staff there, was let out for a month, but had now returned to the camp at Ruhleben.

BELGIUM AND AUSTRO-HUNGARIAN STATIONS AND FRENCH INTERESTS.

In Belgium, we are informed that we are perhaps not carrying on our works there at a great profit, but at no loss. The cost of materials is naturally very high; and there are difficulties about supplies, but we get them. We are, however, adding, owing to the difficulties of the Belgians in getting coal and oil, largely to our consumers; but, at the same time, the increase does not cover the deficit through the number of absentees. As to our Austro-Hungarian stations, we are informed, on the very best authority, that things are not doing very badly there. That is all we hear. Now I come last to our interests in France. We learn from a German technical journal (and we saw there a photograph, which was reproduced in our journals here) of damage done by bombardment to a gasholder at Lille, which was repaired. We know that Armentieres in the British lines is still out of action; and the Pont-à-Mousson works—a Company in which we are interested—are also out of action through bombardment. But these losses are small, compared with the greater losses from which we are suffering, in respect of our French interests, in the way of excessive costs of coal and freight. The last time I had the pleasure of addressing you I talked of a price of 19s. for coal and of 21s. for freight. Now the price of coal is anything between 32s. and 37s., and the cost of freight is up to 45s. This, in some respects, I am glad to say, does not affect us, because we made a forward contract delivered to French ports, at a price varying from 33s. 6d. to 34s. But, even so, you may well imagine the loss to—I will not say to our French stations, because we have none, but to our French interests, is great; and at the present time the French companies owe us a matter of 780,000 frs. I may say, to somewhat relieve this gloom, that our representative in Paris (M. Delebecque) has taken advantage of the recent decision in the Bordeaux case to approach the various municipalities, in order to get our prices for gas raised, because with the exception of three little stations—Thizy, Uzès, and Morez—which use French coal, all these French towns have to look to England, and have to pay these big prices before they can get supplies.

THE FLUSHING STATION, AND COAL DELIVERIES.

I should like to make reference to one place—the sole remaining station under our control—Flushing. This station, as you know, has never been one upon which we could flatter ourselves that we had a very brilliant profit. At the present moment, we find it impossible to get any English steamers there; and we have to employ neutral steamers, principally Dutch, to take coal there for us. Then we have to get an export licence from the British authorities, and an import licence from the Dutch authorities; so that you can well imagine the time that is exhausted over these formalities before we can get steamers into Flushing. It may be interesting to you to know that the price we paid for the last cargo from Flushing was 44s. per ton delivered, as compared with the pre-war price of 16s. c.i.f. On a recent occasion, when at last some coal arrived at Flushing, outside labourers who had been engaged refused to discharge the vessel, unless their pay was raised. Our Engineer, Mr. van Niftrik, however, with very commendable promptitude, set to work, with the willing help of his own clerks and staff, as well as a number of Belgium gentlemen, and succeeded in unloading the steamer, without having incurred any demurrage. [Applause.]

AN INCOME-TAX DEMAND.

The last time I addressed you, I spoke of a little bill that had been sent in to us amounting to £100,000 for income-tax. I told you then that we were going to appeal; and I should like to say that the authorities agreed our figure of £54,311, which we claimed to be the right sum on the three years' average. The authorities asked for the payment of £50,000 down; the rest being left for future adjustment. I must say we parted with this money with some reluctance, because we had got no profits, and no money coming in. But it was a case of the country needing the money, and of it being legally due from us, and so we paid it. Naturally enough, these payments, and the assistance of which I have already told you of 780,000 frs. to the French companies we control, have not exactly increased our liquid reserves.

THE BILL IN PARLIAMENT.

There is one other subject of which I have to speak—that is the new Bill which we have in Parliament. Begun in the House of Lords, it passed, with some slight amendment, through that House, and then went into the House of Commons; and, with the exception of one little verbal amendment, it got through the consideration stage, and only awaits the third reading in the Commons, further consideration of the amendments in the House of Lords, and then with the Royal Assent it will pass into law.

TRANSFERS OF STOCK.

Going back to my original motion—"That the common seal be affixed to the register of proprietors," I may say with regard to a matter referred to by Sir Perceval Laurence at the last meeting, I have provided myself with figures as to the capital stock affected by transfers. In the half year to May, 1915, there were 78 transfers, representing £15,053. That was the total stock sold in the half year. In the half year to November, 1915, there were 74 transfers, representing £14,409 capital stock; and in the half year to May, 1916, there were 137 transfers, representing £33,574 of capital stock. These taken percentually on the total capital—now £4,940,000—work out to 0·32 per cent., 0·29 per cent., and 0·68 per cent. respectively. In the half year to December-1914—a normal half year—the number of transfers was 346, represent, ing £82,306 capital stock, or 1·68 per cent. I may add that more than 50 per cent. of the above sales since the war started are on account of the liquidation of the estates of deceased proprietors.

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) seconded the motion, which, without discussion, was unanimously carried.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN Mr. Harold Godfrey Palmer and Mr. Robert Tindall were re-elected to their seats on the Board.

The DEPUTY-CHAIRMAN proposed that Sir Charles Jessel be re-elected a Director. He said he would not trouble the proprietors with a speech, because they knew as well as he did how fully qualified Sir Charles was to be a Director and the Chairman of the Association. He had given full evidence at the various meetings of late of his great ability and devotion to the interests of the Association. In these times of storm and stress, they required a man of resolution and experience at the tiller of this ship; and he was sure if they were to search the City of London through, they would not find a man better qualified than Sir Charles for the office of Chairman of the Association.

Mr. TINDALL seconded the proposition, which was heartily carried.

Proposed by Mr. BERNARD F. HARRIS, seconded by Mr. PILCHER, Mr. T. Bromhead Bassett was reappointed one of the Auditors.

Sir JOHN RUNTZ said he should like to move a vote of thanks to the

Chairman, Directors, and officers. The proprietors regretted the unavoidable absence of some of the Directors; they also regretted a great deal the absence of a dividend. He was afraid, however, it would be some time before they received anything in this direction. When the history of the Association during the war came to be known, the proprietors would find that their Directors had not been idle in the best interests of the Association. The interests of the proprietors were well looked after by them. In the vote, they ought specially to include their excellent Secretary, Mr. Wilson. Every member of the Board would emphasize what he said in connection with Mr. Wilson, that he was a valuable officer indeed. He hoped it would be many years before they saw anyone else occupying his place.

Mr. A. F. PHILLIPS seconded the motion, which was cordially adopted.

The CHAIRMAN said he thanked the proprietors very much for their kind vote. He might say with respect to the staff that they had been enabled, through unfortunately not having quite so much to do as they would like to have, to lend two members of the staff to His Majesty's Government. These two men—Mr. Gladwell and Mr. Williams—they had heard repeatedly from various people were very valuable men in their new office. He (the Chairman) was not astonished, because when Mr. Wilson was asked to send two of the staff to the offices of the Board of Trade, he was determined that the Imperial Continental Gas Association should not be dishonoured in its representation. He sent two of their best men; and they had shown what the staff of the Association could do under the able training of Mr. Wilson.

LEEDS AND ITS GAS-WORKS PROFITS.

The Gas Committee of the Leeds Corporation, at their meeting last Tuesday, had submitted to them the annual financial statement of the gas undertaking for the year ended March 31.

The accounts show a net surplus on the year's working of £14,838, as compared with a net deficiency of £39,982 the previous year. The quantity of gas sold during the year was 2,559,852,900 cubic feet, as against 2,700,841,000 cubic feet in 1914-15. The gas profit rose from £79,181 to £126,299, an increase of £47,118. The surplus profit of £14,838 was made up by the increased price of gas and the higher prices obtained by the sale of residuals. A considerable increase is to be found, too, in the revenue from gas-stove rents; the receipts having increased from £4358 in 1914-15 to £5843 in the past year. During the year the sum of £74,374 was received from the sale of coke, as against £51,993 the previous year. There was an increase of over £7000 in the sale of ammoniacal liquor; but a decrease of nearly £4000 in the sale of tar. The total expenditure showed an advance, owing to the increased cost of coal, of over £10,000.

Figures are available as to the effect of the "Summer Time Act" coming into operation last week. The gas-works on the first day distributed 3,693,000 cubic feet, which, despite the hour's extra daylight, was 393,000 cubic feet more than on the corresponding Sunday of last year. The largely increased number of gas-cookers and gas-fires is said to be mainly responsible for the increase in the total consumption of gas.

RIPON GAS SUPPLY.

There was a heated discussion on the gas supply question at the meeting of the Ripon City Council last Thursday, as a result of which the Chairman of the Gas Committee (Mr. J. Brown), the Deputy-Chairman (Alderman Walker), and Mr. W. A. Goldsworthy resigned their positions on the Committee.

As already recorded in the "JOURNAL," the Gas Committee of the Ripon City Council brought forward a scheme for the installation of vertical retorts at an estimated cost of £9000. The Local Government Board, after the usual inquiry, declined to sanction the borrowing of the money, and the Committee decided upon patching-up the present plant. On plans suggested by Mr. W. Doig Gibb, the work was commenced under the supervision of Mr. J. W. Dunn, of Stockton, who had been appointed Engineer under the retorts scheme. At last Thursday's meeting, Alderman Thirlway moved that Mr. Carr, another gas expert, be called to advise as to the best method of putting the present works into working order for the coming winter, and Alderman Fennell seconded. Alderman Walker contended that this motion was out of order; Mr. Gibb having been, by order of the Council, appointed to advise the Committee. Mr. Kearsley said the Council were clear of Mr. Gibb, who had finished his work and been paid for it. The scheme of vertical retorts was brought forward not in the interests of the ratepayers, but in the interests of friendship. Mr. Brown said he denied this. Mr. Kearsley: It is purely a matter of friendship. Hundreds of pounds have been wasted for friendship, and the ratepayers are having to pay. Mr. Brown: The ratepayers have not paid a cent. Mr. Kearsley: No, but they will have to. I say it has not been carried out in the interests of the ratepayers from the very start; and anyone with half an eye can see it. The Mayor said he was ashamed of Mr. Kearsley for using the expressions he had. They were absolutely unworthy, because they were quite untrue. He was satisfied the Committee had acted for the best, and no member had any right to impute motives to a fellow-member without adequate proof. All the trouble had arisen out of petty personal feeling; and every possible opportunity had been taken to hamper the Gas Committee.

Alderman Walker remarked that, after what had been said, he absolutely refused to take any further part on the Gas Committee at all. He resigned his position. He might have made mistakes; but his reputation in public life could be put against that of any other member of the Corporation. The Committee had acted straightforwardly and honourably, and had nothing to hide. Mr. Goldsworthy and Mr. Brown also resigned. Mr. Brown repudiated what Mr. Kearsley had said. The vertical scheme was brought forward because they were assured that it was the best system of gas manufacture. He had no axe to grind. The Committee were trying to save the ratepayers' money. Mr. Kearsley said he did not want to keep up a spirit of bitterness. The Mayor: I take it that Mr. Kearsley withdraws his insinuation that this was done for friendship? Mr. Kearsley: I do not withdraw it. I could substantiate a great deal more. The Mayor ruled Alderman Thirlway's amendment out of order; and eventually the Gas Committee's minutes were confirmed.

LEEK GAS-WORKS RESULTS.

Some figures from the gratifying second annual report of Mr. R. H. Ginman, the Engineer and Manager of the Leek Urban District Council Gas-Works, were given in the "JOURNAL" for the 9th inst. [p. 292] and it is pleasing to note that the Council have congratulated Mr. Ginman, and increased his salary.

At the monthly meeting of the Council, the Lighting Committee submitted the report, and stated that they considered it to be highly satisfactory. They recommended that the salary of Mr. Ginman be advanced to the maximum fixed on his appointment—£250 a year.

Mr. SHUFFLEBOTHAM said he did not think it was the wish of the Committee to let the matter pass without heartily congratulating the Gas Manager upon the excellent year he had had, notwithstanding the trying circumstances.

Mr. FURMISTON thought it would only be right to say how the Committee appreciated the splendid work of Mr. Ginman in a very trying year. At the beginning of the year, they estimated that if they made a profit of £500 they would have done well; but instead they had a balance of £1200 on the right side. The works had never been in a better condition; and notwithstanding the difficulties as to coal, they had a larger stock at the gas-works than there had ever been before—a condition of things which did not exist in other towns.

The minutes—which included a recommendation that a sum of £350 be paid to the district fund in aid of the rates—were passed.

ROTHERHAM CORPORATION GAS DEPARTMENT.

The Year's Accounts.

The report and accounts of the Rotherham Corporation Gas Department for the twelve months ended March 31 have been issued.

The Engineer and Manager (Mr. J. S. Naylor) states that the quantity of coal carbonized was 24,270 tons, at a cost of £17,471, or 14s. 4·75d. per ton, as against 27,050 tons the previous year, costing £16,751, or 12s. 4·62d. per ton—an increase of 2s. 0·13d. per ton. The gas made was 325,364,000 cubic feet, as against 352,931,000 cubic feet—a decrease of 27,567,000 cubic feet, or 8·47 per cent. The gas made per ton of coal carbonized was 13,406 cubic feet, compared with 13,047 feet—being an increase of 359 feet per ton. The past year's make per ton "constitutes a record for the department." The quantity of gas sold was 289,588,000 cubic feet, as against 316,992,000 feet—a decrease of 27,404,000 feet, or 8·64 per cent., "entirely due to the restricted lighting." The unaccounted-for gas was 32,890,000 cubic feet, or 10·05 per cent. of the make, as against 32,904,000 feet, or 9·28 per cent.

The prices of residuals varied considerably during the year. While coke realized much higher prices than was anticipated, tar showed a considerable falling off. Liquor was somewhat better, owing to the high price of sulphate of ammonia.

The public lighting of the borough, including wages and maintenance of lamps, cost £2737, as against £4799 last year—a decrease of £2062. The cost of the gas used for public lighting amounted to £1025, as against £2760, or a decrease of £1735—"due to the restrictions enforced by the Home Office under the Defence of the Realm Act."

An ample sum has been allowed for depreciation before arriving at the gross profit made, which is given as £16,449, against £16,146, or an increase of £303. The net profit (after allowing for interest, redemption instalments, and contributions to the sinking funds, amounted to £7080, as against £6600, or an increase of £480.

Mr. Naylor remarks in conclusion: If the gas for public lighting (£1025) is again given by the department as in former years, and a sum of £1300 is set aside as a provision for excess profits duty, there will remain an available surplus profit of £4755, being an increase of £915 over the previous year.

TESTING FOR CALORIFIC VALUE IN NEW YORK.

The Public Service Commission of New York State recently gave the following public notice:

Stations for testing the heating value of gas supplied by companies in the No. 1 District will be established in all boroughs in a short time. The Commission will establish also a heating power standard instead of, or in addition to, the present legal requirement of 22 candle power in the city.

The Commission is empowered under the law to fix standards for the measurement of both the illuminating and the heating power of gas irrespective of the candle power fixed by Statute; and it now proposes to exercise this power. The Commission believes that the value of the 22-candle power standard is extremely questionable, for the reason that under modern conditions, when comparatively few open-flame burners are used, when mantle lamps are used extensively, and when gas is used largely for heating, cooking, and power purposes, the candle-power test is obsolete.

It is pointed out by the Commission that natural gas, which has little candle power, is useful and valuable for heating and power purposes;

that coal gas of from 12 to 14 candle power may be just as effective for such purposes as water gas of 20 to 22 candle power; and that in scientific circles it is now a recognized fact that a heating value standard is the most satisfactory and desirable under present conditions.

Co-operating with the Western New York Commission, the Commission for New York City has investigated the subject, with the result that a Joint Committee of representatives of up-State gas companies and of the up-State Commission made a detailed examination of gas supplied by sixteen companies, and submitted a report to the effect that modern appliances require that gas should have a heating value only, that the present candle-power standard impedes distribution, increases expense because of the rising price of enriching oils, and is wasteful and unduly burdensome on the consumer as well as on the companies.

WOMEN IN GAS AND WATER WORKS.

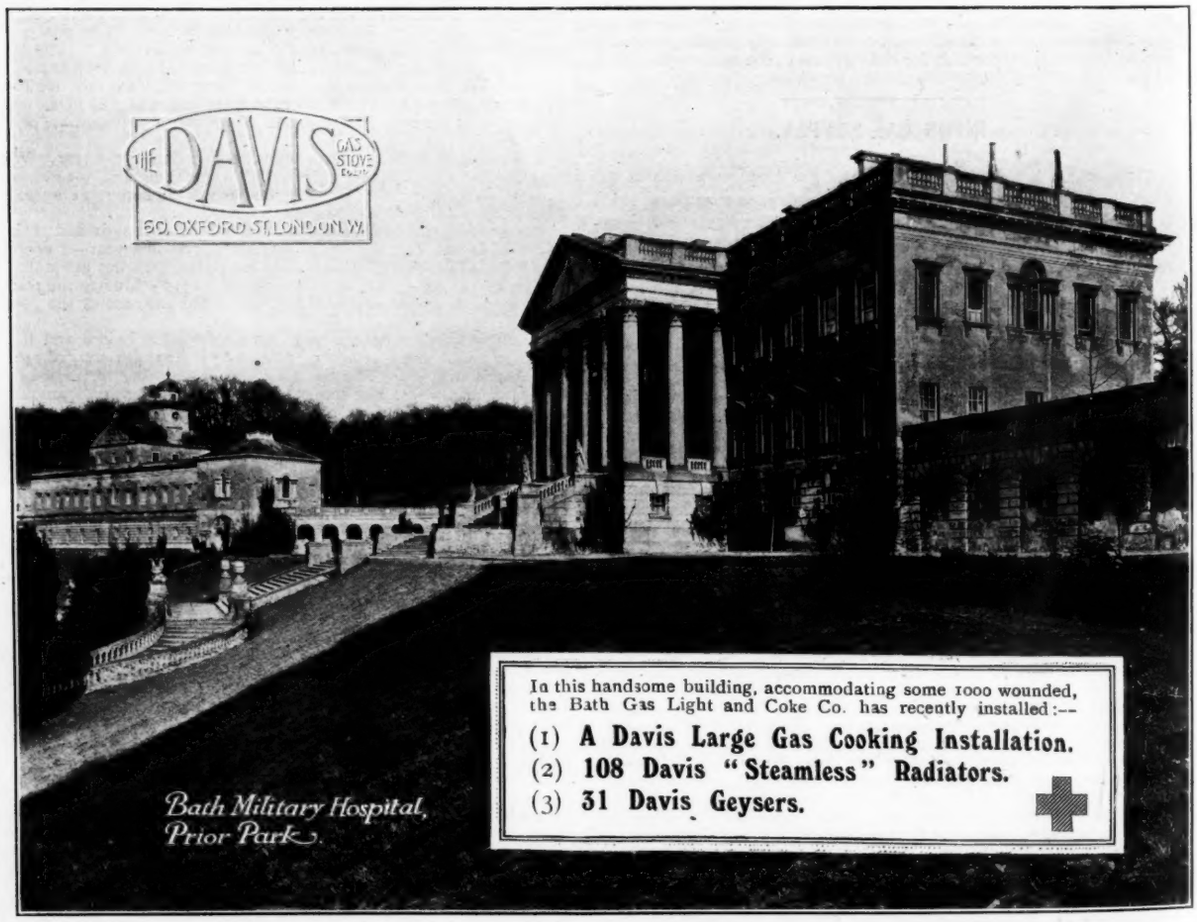
Last week "The Times" had some articles, entitled "Women in Industry," the second of which dealt with the question of female employees in gas, water, and power stations. The "Evening News" also referred to the same question; and allusion to the figures thus adduced are dealt with in a leader paragraph elsewhere to-day.

A few extracts from our morning contemporary's second article may be reproduced in these columns. It is pointed out that the question of training is a difficulty in connection with a great deal of municipal supply work, whether under the local authority or under a company. There are a few jobs connected with the water service which women may perform; and there has been a certain amount of substitution here already. But it is not a very promising field for a substitution campaign, partly because the water-works and the management of the water-mains do not employ any considerable number of men of military age. In electric power station work, again, the comparative smallness of the number employed at any one station, the laboriousness of some parts of the work, and the long professional training required for other parts, suggest that the maximum possible amount of substitution will prove to be inconsiderable. But even here there may be a fair amount of the lighter kind of general labour which the sturdiest class of working women can well take over; and in electricity departments, as distinct from power stations, there is very little doubt that substitution could go a good deal further than it has gone hitherto. This is suggested by the case of gas-works. As there are still from 25,000 to 30,000 fit men of military age in the gas and electricity services of the United Kingdom, the problem is well worth tackling.

What one notices especially (our contemporary continues) is the "patchiness" of the situation in the gas industry. As between one town and another, or in the metropolitan area as between one company and another, there are the most marked differences of policy. Actual experience has shown that women can be employed to advantage in a very great variety of jobs. As clerks, of course. Equally, of course, as attendants in the show-rooms and as show-room cleaners. With a little easily acquired training, women and girls can fit gas-stoves, and undertake the cleaning and maintenance of lamps and incandescent mantles. They can serve as messengers without any training at all. They need no great deal of training to serve as collectors of accounts. Then there is meter work—both in gas and electricity. Selected women have been already employed with success in testing, reading, and inspecting gas-meters.

But what can be done is shown in the case of a certain Midland town which has taken on about fifty women navvies, for its municipal gas-works. Some of them it found locally; others it brought from a neighbouring colliery district. It pays them 24s. a week for a 55 hours' week—ten hours a day and a half-day on Saturday—gives them free housing and charges them 1s. 6d. a day for their board. Their main work is filling barrows with coke or breeze, washing the coke, and wheeling it up planks to its appointed place. Not every woman's work, but for those who can manage it healthy enough, and at these rates evidently well paid. A second town not very far away is trying women coke loaders, experimentally, at a wage of 25s. a week. And there are a number of other instances of the same class, both English and Scotch, though several of them are still in the experimental stage. Indeed, when one looks up and down the country, it is surprising to find how much general labour women—in particular the sturdy women of the coast and colliery districts—can undertake at a pinch.

With all these openings in connection with the maintenance of the gas service for women of every grade—from the meter tester to the coke shoveller—one can still find important works which have not yet even begun the business of substitution. One company will have pushed the matter and already have hundreds of women in its service; another will have made no move. One municipality is training its meter testers, or fetching its women navvies from a distance; another is still certain that all the men who do these and all the other jobs which they did in time of peace are indispensable, even though of military age. And hitherto, as might have been expected, the more enterprising companies or municipalities have been in a minority. It does not appear that the introduction of women has met with any appreciable opposition or criticism; so that time and energy have not had to be spent in deciding what processes shall be thrown open to them, or on what terms they shall work side by side with men. And apparently women can be found in most places fitted for, at any rate, the majority of the tasks which they may be called upon to undertake in gas-works or gas-light departments. It is not to be expected, perhaps, that absolutely all the twenty-five to thirty thousand potential soldiers can be set free from gas and electricity works in the near future, or indeed ever. On any showing there are probably a very fair number of out-and-out indispensables. But there seems no kind of doubt that a very welcome addition to the forces in training might be made from this source, as soon as the best practice in the matter of substitution has been generalized.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THE MONAZITE SANDS AT TRAVANCORE.

Correspondents in the "Indiaman" newspaper have lately been raising the question as to where credit should be given for the discovery of the important deposits of monazite sands at Travancore. One correspondent last month seemed to give the impression that the discovery was duly published in the "Records of the Geological Survey of India," and that it was entirely the "result of the carelessness, or worse, of English scientific men and manufacturing technologists" that the deposits "fell into German hands."

The facts are quite otherwise, according to a later correspondent of our contemporary, who writes: It may be the case, as Sir Thomas Holland is reported to have said, that "the occurrence of both monazite and wolfram were recorded long ago in the 'Records of the Geological Survey of India;'" but the same records state that the monazite sand deposits at Travancore were discovered by the German prospector Schomberg in 1909. The Syndicate on whose behalf Schomberg acted secured a concession to work the deposits in or about the same year; and it was not until November, 1909 (after Schomberg's discovery), that the Geological Survey of India sent a member of its staff to examine the deposits. His belated report was not published until 1914—five years after the Germans had secured at least a temporary monopoly of what has proved to be the richest deposit of monazite in the world.

Sir Thomas's remark, that the "Records of the Geological Survey of India," "like most things Indian, it is sad to say, have been studied far more seriously in Germany than in England," fails of its effect so far as Travancore monazite is concerned. There is not much to be said from a commercial point of view for studying a scientific paper on a mineral deposit which appears five years after your competitor has secured the deposit. If the Indian authorities had had any acquaintance with the British gas-lighting industry, they would have known that since about 1905 strenuous efforts had been made by certain manufacturers to break the German thorium monopoly, and that these manufacturers would almost certainly have welcomed the opportunity afforded by the discovery of the Tranvancore deposits to secure this object. It is believed that, as a matter of fact, the Indian Government did try to secure British control of the deposits, and were defeated by the ingenuity of the German Incandescent Light Syndicate, though this did not become apparent till after the outbreak of war, when the German monopoly was broken—it is to be hoped finally.

Sir Thomas is nowhere happy in his references to monazite. He appears to be under the impression that the public is wrong in believing that the value of monazite depends on the amount of thoria the mineral contains, and refers to the realization by the Germans of the value of the other so-called "rare earths" in monazite. It will probably be news to him that one of the most interesting uses of these other "rare earths" of monazite is British in invention and in application, and forms a useful but small British industry at the present time. As a matter of fact, however, all the German and British users put together cannot consume more than a small fraction of these other "rare earths," and they have no practical effect on the value of monazite, which, as the "general public" rightly believes, is determined by the amount of thoria in the mineral.

After giving another example of the Indian Geological Survey's neglect of the commercial and industrial side of its work—the question of the Khewra potash deposits—our contemporary's correspondent concludes: "The Travancore monazite muddle and the neglect of the Khewra potash deposits seem to indicate clearly that the Survey needs external assistance from time to time to direct its energies into channels which will lead to the better utilization of the mineral resources of India for the benefit of India and the Empire at large."

TRIBUNALS AND EXEMPTION APPLICATIONS.

Before the Redcar Tribunal last Friday, Mr. M. Fligg (Manager of the Redcar Gas Company) asked for the exemption of seven employees—the chemical assistant, draughtsman, and tester, the head clerk and cashier, four skilled gas stokers, and the engineer. Mr. Fligg stated that he wrote to the Ministry of Munitions pointing out the serious position the Company were in through all their single men having gone. The reply of the Ministry was to the effect that he should have no anxiety, as the occupation was certified, and that skilled and indispensable men were entitled to receive exemption by the local Tribunal. Mr. Fligg explained that during last winter the Company had 21 stokers. They had now 15; but 21 would be required next winter. Three clerks had joined the forces, and three others would be going up with the last groups; and if the employment of female labour became necessary in the office, he considered that a man to supervise the work would still be required. This was the reason why he asked for the exemption of the head clerk. The Ministry of Munitions said that only those engaged inside works were reserved. There was not an unmarrried man in the works. The Company had encouraged recruiting in every possible way. For stoking, men over military age were extremely difficult to get; and it was not work that women could do. He started two men above age at the work not long ago. One worked half a shift, and the other two shifts; and then they asked for their wages. The clerk was refused exemption; the remaining six employees were exempted while engaged in their present employment.

At a meeting of the Saxmundham Urban District Tribunal, the Chairman of the Saxmundham Gas Company applied for the exemption of their Working Manager. Exemption was granted for two months, with power to appeal later, to enable the Company to try to procure another Manager. Conditional exemption, so long as he remains in his present occupation, was also granted to the day stoker.

At a sitting of the Lincoln and Lindsey Appeal Tribunal, Mr.

The Main Advance.

THE introduction of the ***New*** Main Cooker marks a great advance in cooker construction. A salient feature is the treble-crowned oven packed with non-conductor which reduces loss of heat to a minimum. There are many other features which will interest you. Send for particulars or, better still, a sample, which will convince you.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Page, representing the Skegness Gas Company, appealed against the decision of the local Tribunal in refusing exemption to their accountant and a labourer, on the ground that the staff of the Company had been reduced from twenty to eight, which the Company contended was the minimum with which the gas-works could be properly carried on. Mr. Page urged that this was a case of national importance and public utility. The Chairman (Mr. A. C. Newsum) asked if gas was much needed in Skegness, with the Daylight Saving Act in operation; and the Manager replied that the Act had made very little difference, as gas-cookers were largely used. Exemption until Oct. 20 was granted to the accountant; and the Military Representative remarked that he supposed this did not mean the Company were not to try to get a woman to do the work. Mr. Page: Are you serious in suggesting a woman substitute? The Chairman: Yes, of course. I do not think people realize until they have tried it what women can do in grasping what are called "technical" points. As to the labourer, the Tribunal decided that he must go.

A representative of the Coal Distillation Company again appeared before the Middlesbrough Tribunal last Wednesday, and made a further application for the exemption of certain men employed on the bye-products plant. It was stated that the firm had asked for badges for the men the previous week; but these had not arrived. Time was allowed, until July 1; and the Company was told to apply again for the badges, as otherwise the men would have to join the Colours.

The Ilfracombe Gas Company applied last week for exemption for three men—the chief clerk, a fitter, and a foreman fitter and inspector. Mr. Armstrong, the Manager, said three men from the fitters' shop and two from the office had joined the Army. The tribunal decided to grant conditional exemption to all three men.

At St. Austell, Mr. H. E. Riley, the Manager of the Gas-Works, applied for exemption for the only fitter left. At the outbreak of war they had four fitters and two apprentices. Women could not do the work, though they were employing them for the maintenance and renewal of burners. The tribunal granted exemption.

Application was made before the Torquay tribunal by Mr. F. Chalmers, the Manager of the St. Mary Church Gas-Works, for the exemption of two men employed at the works. One was granted conditional exemption; and the other was allowed until Aug. 15. Mr. Chalmers said there were over 2000 consumers, and this was the only skilled fitter left to deal with the services.

A result of the Local Government Board's refusal to sanction the loan for gas-works purposes to the Ripon Corporation was an appeal by the Military Representative, at a sitting of the Ripon City Tribunal last Friday, for the revision of the certificate granted to Mr. J. W. Dunn, the Engineer of the vertical retort scheme. It was stated that exemption was granted on the supposition that the Local Government Board would sanction the money for the erection of new plant. It was understood that the Board had refused the application; and it was claimed therefore that Mr. Dunn's services were not indispensable. The application was refused, and the exemption to June 30 thus remains good.

AMERICA AND COAL-TAR DYESTUFFS.

Coal-gas residuals and their application formed the subject of a lengthy paper read early this year by Mr. F. H. Wagner, at a meeting of the Franklin Institute of Philadelphia. An account of the various residuals, and their uses, was given; and there was a diagram showing the products from the distillation of 100 tons of bituminous coal, similar to that included by Mr. W. J. A. Butterfield in the address he delivered last year at the Cardiff Conference on the Extension of British Trade.* In the section dealing with coal-tar and benzol products, the author made the following remarks.

A large number of our industries are dependent upon the use of coal-gas bye-products for their successful operation, as is witnessed by the subjoined statement, taken from the census of 1909. The principal industries dependent upon coal-tar products, with the number of employees, capital invested, aad annual value of product, are:

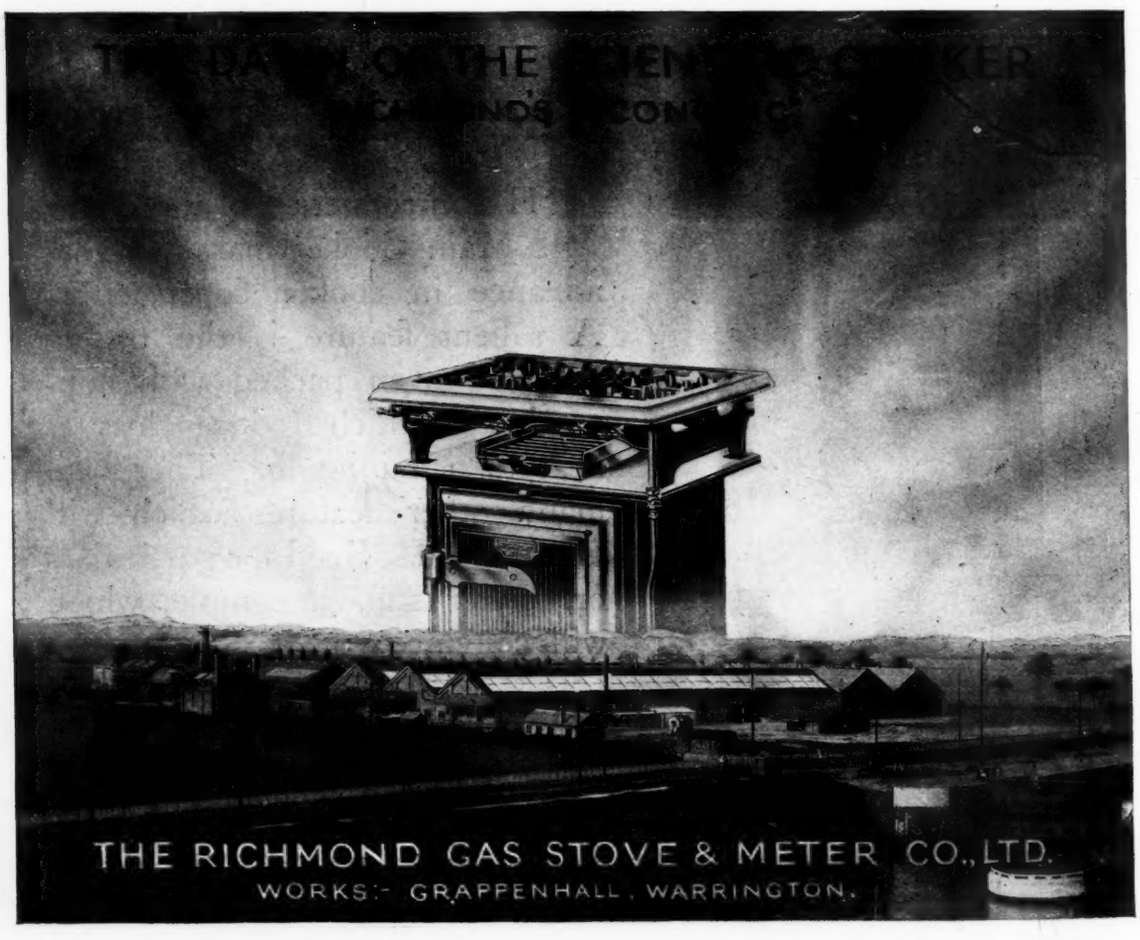
Industry.	Employees.	Capital.	Product.
Textile. . . .	916,000 ..	$1,841,000,000 ..	$1,685,000,000
Leather . . .	62,000 ..	323,000,000 ..	328,000,000
Paper	81,000 ..	400,000,000 ..	260,000,000
Paints and colours	30,000 ..	250,000,000	

Thus we find a total of 1,089,000 persons employed in these four industries with a capital investment of $2,814,000,000, and an annual product for the first three representing $2,273,000,000 in value. Since the 1909 census, these industries have all increased their production; and, taken in conjunction with other manufacturers—such as the producers of shoe dressings, writing and printing inks, &c.—it is perhaps safe to estimate that at present fully 2,000,000 persons find employment in industries dependent upon dyestuffs for their success.

Artificial dyestuffs, produced from the bye-products of coal distillation, have practically displaced those formerly used; and this is properly so, because the artificial material is easier applied, has greater brilliancy of colour, and can be secured in a great variety of shades. But, unfortunately, our American industries have always depended on Europe to supply the necessary material. Statistics teach us that 80 per cent. of our coal-tar dye requirements are imported from Europe, principally from Germany; the other 20 per cent. being produced by American manufacturers. But here, again, we find that we must turn to Europe for our supply of the greater portion of the necessary intermediates, or raw product, before we can produce this 20 per cent. of colouring matter.

The present war soon brought about an acute situation among our manufacturers, as the stock on hand was soon depleted, and a replenishment became almost impossible. These conditions certainly compel us to turn seriously towards our own supply of tar and benzol,

* See "JOURNAL," Vol. CXXX., p. 206.



and cause us to question ourselves as to our ability to do that which we have permitted others to do for us. Several American manufacturers have gone ahead vigorously in an attempt to supply our domestic needs; and while these firms are being supported by the allied industries to-day, the question as to their future is still an open one. We have the necessary raw material, tar and benzol, on hand; and a lack of these products will soon bring about their further recovery, if the situation should demand it, as the greater amount of coal carbonized for the production of coke in America is still produced in the wasteful bee-hive oven. Economic and commercial conditions have prevented the development of the dye and other allied industries in this country; and consequently our manufacturers have in the past diverted their raw material in great measure into the production of tar oils and pitches.

The cost of producing dyes in this country is said to be 44 per cent. greater than in Germany, as it is estimated that the cost of a plant capable of producing 3,000,000 lbs. of dyestuffs per year would be $104,000 in the United States and $70,000 in Germany; while the labour required would amount to $116,236 in the United States and $51,493 in Germany. The cost of material would be $443,000 in the United States and $317,000 in Germany. These comparative figures show a vast difference in favour of Germany; and the successful establishment of this industry in our country would require that protection in some form be given the American manufacturer in order to make up this discrepancy.

The discrepancy is even greater than these figures would seem to indicate, because the German manufacturer has been in the habit of selling up his surplus production, and that at a figure lower than the one paid by the domestic consumer. The establishment of this industry in the United States means opposition to the pre-eminent position of the Germans, whose success is based on a solid foundation of thirty years' standing, and which, therefore, becomes a challenge to our chemists and capitalists. We have the necessary raw material, and we possess constructive engineering ability of a character which can supply all of the needful apparatus; but, with all this, almost unlimited capital and patience will be required. But this is not all that is required, as chemists, trained in this particular work, are not numerous in this country; and their necessity is shown when it is mentioned that in one German works, producing about 500 colours, we find 300 chemists employed. Of these, about 100 are engaged in analytical work, and the other 200 are in charge of the actual manufacture of the dyes—thus placing the production of only two or three colours under any one chemist.

After the capital has been supplied, and the industry been properly started, it will be necessary to secure proper legislation prohibiting "dumping" on our shores—a performance heretofore practised by the Germans—as well as a prohibition against an unfair restraint of our trade, due to the arbitrary action of the German monopoly which is now allowed by foreign law, but not permitted by our own. Any scheme entered into must, therefore, necessarily depend on an effective law which will prevent the control of our markets by foreign monopolies in the same manner as a domestic monopoly is now prohibited. Advices received from Germany indicate that the German monopoly will re-enter the American market as soon as the war is over, and that it will make tremendous efforts to regain the lost business—being prepared to make extraordinary concessions in order to take the business from its infant competitors. It therefore is required of us that we place the new industry on a firm foundation as soon as possible, and that we seek such Federal legislation as will permit the continuance of the project without financial loss.

NOTES FROM SCOTLAND.

Death of the Burntisland Gas Manager.—Mr. Alexander Ross, Gas Manager to the Burntisland Corporation, died on the 22nd inst. When the gas-works were taken over from the North British Railway Company in 1879, Mr. Ross was also transferred as Manager of the concern; so that his service as Manager extends to between forty and fifty years. The town acquired the works 37 years ago from the Railway Company for £6300, and the present valuation of the works is approximately £28,000—the consumption of gas in the town having trebled during this period. Extensions and improvements in the works and plant have been made from time to time at the instigation and from the plans of the late Mr. Ross, who was always regarded as an efficient and resourceful servant. To matters scientific and antiquarian Mr. Ross devoted much of his leisure; and he had acquired a wonderful collection of instruments and articles pertaining to these branches of knowledge. He was in his 78th year.

Paisley Water Supply.—A sixth water reservoir has recently been completed for the Paisley Water Commissioners, of a capacity of 1200 million gallons. There was an inspection by the Water Commissioners yesterday week, when Provost Robertson turned on the water to the new reservoir. At the close of the ceremony he was presented, on behalf of the Town Council, with a silver cup as a memento of the occasion.

Bo'ness Electricity Works Extension.—The Bo'ness Town Council have accepted an offer of their contractors, the National Electric Construction Company, Limited, to carry out a modified scheme of extension at the electricity works for a lump-sum of £12,300.

Lighting of Municipal Buildings in Westminster.—The Contracts Committee of the Westminster City Council, in a report recommending the acceptance of the revised charges of the Charing Cross Electricity Company and the St. James' and Pall Mall Company, stated that, though they were still considering the advisability of substituting gas lighting in the buildings now supplied with electricity, they proposed that for the present the latter should be continued. The Council agreed to this.

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Illustrated List on application.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 29.

Tar products in this market remain in a very quiet situation. Creosote s somewhat improving in value; and it is possible that this material may find another useful outlet at home. Pitch and other products are unchanged in quotations.

Sulphate of ammonia continues to gain a little strength, and rather better prices are reported from the Provinces; but London makers have not reported any sales of 25 per cent. quality lately.

Tar Products in the Provinces.

May 29.

There is nothing fresh to report concerning the market for tar products. No business of importance has been reported in pitch. Creosote is offering at reasonable prices. Solvent naphtha is unchanged. Heavy naphtha is in fair demand.

The average values of gas-works products during the past week were: Gas-works coal tar, 15s. 6d. to 19s. 6d. Pitch, East Coast, 15s. to 15s. 6d. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¾d. to 7d. Solvent naphtha, naked, North, 2s. Heavy naphtha, naked, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2¾d. to 2⅞d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene, salts, 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *May* 27.

During the past week there has been a large amount of buying for munition purposes, and this, together with the requirements for export, has brought about a further advance in values. At the close, the tone is very firm, and quotations for prompt delivery are £16 18s. 9d. per ton f.o.b. Hull, £17 1s. 3d. f.o.b. Liverpool, and £17 2s. 6d. f.o.b. Leith. For delivery in equal monthly quantities over the second half of the year, £17 5s. per ton has been paid at both Liverpool and Leith. Some makers have now raised their price for this period, but buyers have refused to follow.

Nitrate of Soda.

The market for this material is a little easier on spot, and prices are reduced to 18s. 7½d. per cwt. for ordinary quality, and 19s. 3d. for refined.

Sulphate of Ammonia.

From another source it is reported that for this article to-day's quotations are as follows: Outside London makes, £15 12s. 6d. to £15 15s.; Hull, £16 10s. to £16 12s. 6d.; Liverpool, £16 12s. 6d. to £16 15s.; Leith, £16 15s. to £16 17s. 6d.; Middlesbrough, £16 12s. 6d. to £16 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is irregular, and will not settle down until the methods of regulating prices and freights are decided and tested. It will be remembered that while the price of coal for home contracts is "regulated" compulsorily, any such regulation for export coal is by "arrangement" only. In the steam coal trade, the demand is still very keen; and though the prices vary much more than they did, the actual figures are defined largely by times of delivery and the needs of consumers. It is difficult to give quotations for these reasons, and also because the new "arranged" values are not yet operative. Best Northumbrian steams may be put as from 60s. to 61s. per ton f.o.b.; second-class steams are 50s. to 54s. per ton; and steam smalls are from 30s. to 34s. per ton—the demand for the latter being full. In the gas coal trade, the inquiry is steady; and though prices vary, from 36s. to 37s. 6d. may be given as current figures for best Durham gas coal; for second-class gas coal, near 35s. per ton is the quotation; and for "Wear Specials," 37s. 6d. to 39s. is named—all f.o.b. But much of the gas coal produced is needed under the long contracts, so that the quantities sold at prices mentioned are probably limited. The freights on gas coal are easier to some of the coasting and French ports. The Tyne to London rate is now about 15s., and the French ports are shown by 37s. 6d. to 38s. 6d. Tyne to Rouen; but the "limitation" of freight rates may have more effect shortly. It is expected that this will not interfere with running contracts. Coke is firm, and there is a steady larger export from several of the northern shipping places, which ought to be well maintained for some time. Good gas coke is from 27s. to 28s. per ton f.o.b. on the Tyne—freights being also heavy.

Buenos Ayres Water Company.—The report which will be submitted at to-day's meeting of the Province of Buenos Ayres Water-Works Company, Limited, states that the profit for the six months to Dec. 31 last amounted to £16,955; and adding the balance brought forward, there is an available total of £25,217. After payment of interest and dividend on the scrip note certificates and preference shares, it is proposed to pay 3 per cent. actual on the ordinary "A" shares for the six months, place £2500 to the amortization fund and £500 to the reserve, and write £2000 off expenses of issues of capital—leaving £9377 to be carried forward.

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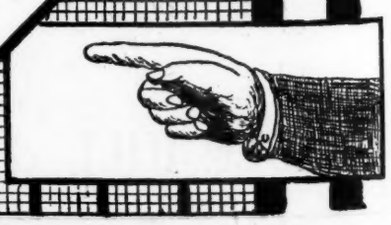

London Office—
165, GRESHAM HOUSE,
OLD BROAD ST., E.C.

Employment of Maimed Soldiers.

The question of finding employment for maimed soldiers was raised at a meeting of the Oldham Gas Committee, when it was reported that a soldier with an artificial leg had been taken on to act as gatekeeper at the Higginshaw works. Before enlisting, the man was employed at the works as a retort repairer and labourer. The General Manager (Mr. Arthur Andrew) wished the Committee to fix the rate of pay that he should have. There was a general discussion on the matter; and it was explained that the man had not had the job found for him, but had taken the position owing to the death of the man who previously occupied it. Mr. Shannon thought, seeing he was doing the same work as the previous man did, he should receive the same amount of pay; but other members pointed out that this was only the beginning of a big question which would arise. Before anything definite was done, there should be a scheme formulated. The Mayor also thought they should consider the question fully before anything permanent was done. In the amount of pension the man might get the wages he was receiving would be an important consideration. If they gave the man a large wage, the pension might only be a small one, and instead of the burden being borne nationally it would have to be borne out of the local rates. Eventually, the Committee decided to give the man £1 per week until they learn what the War Office intend doing.

Price of Gas at Bury.—The Bury Corporation Gas Committee have decided that a uniform charge of 2s. 10d. per 1000 cubic feet for gas be made to consumers in Bury, and 3s. 7d. to consumers outside the borough, less the usual discount for prompt payment. This is an increase of 4d. per 1000 cubic feet.

The Cowlyd Water Scheme.—On Monday last week, the annual meeting of the Conway and Colwyn Bay Joint Water Supply Board was held, when they considered in private for three hours the proposed scheme of the Aluminium Corporation to increase the water power [*ante*, p. 411]; and although the Board confirmed the decision which they had come to in committee, they made no communication on the subject to the Press.

Trouble with the Wolverhampton Water Supply.—Wolverhampton is suddenly confronted with a shortage of water to the extent of a million gallons per day, owing to a serious breakage of one of the rising mains. It is stated that the flanges on the steel pipes which carry the rising main at the Tettenhall pumping-station, broke away from the pipes, though no one had any knowledge that any defect existed. When the flanges gave way, about 254 feet of 17-inch diameter pipe, weighing about 12 tons, fell down the bore-hole and became lodged at a point about 450 feet from the surface. The operation of removing the obstruction will be undoubtedly a difficult and protracted one; and in consequence of the breakage the inhabitants of the town will need to be as economical as possible in the use of water. Temporary pumping plant has been installed.

Records at Hebden Bridge.

The twentieth annual report of the Hebden Bridge and Mytholmroyd Gas Board, for the year ending March 31, was issued last week. It is of more than average interest at the present time, when the price of coal is at a maximum; for the financial side of the report shows a substantial profit on the working, compared with a loss the previous year. The revenue account gives the gross profit as £5705, from which has to be deducted the dividend on the 3 per cent. redeemable stock and interest on mortgage loans, instalments to the redemption and sinking funds, and a small sum to the repair and renewal of cooking-stoves, leaving a net profit on the year of £1773, compared with a loss of £212 twelve months ago. By arrangement with the Local Government Board, an annual instalment, for the redemption of the Gas Board's redeemable stock, was not paid over during the year. If this had been paid, the net profit would have been reduced to £931. The amount of stock issued and other capital borrowed to the end of the year was £104,300. Towards the liquidation of this sum, £30,374 has been set aside, in accordance with the Board's Act of 1895. The profits accumulated since the taking over of the works amount to £2904 (after deducting £1800, which has been paid to the two local Councils). This, with several other funds created out of revenue, makes a total profit of £48,035 since 1896. During the year, £2739 was spent on capital account, bringing the capital expenditure up to £117,822. The Engineer (Mr. T. H. Nield), in his report, states that the working results have been satisfactory, and constitute a series of records for the undertaking. The amount of coal carbonized in the twelve months showed an increase of 1193 tons; and the cost of it had been £1420 more than the previous year.

Enemy Firms Wound-Up.—A further list was published last week of orders made by the Board of Trade under the "Trading with the Enemy Amendment Act, 1916," requiring ten more businesses to be wound-up. Among them was that of Oberfelt and Co.'s Successors (J. Fellner), 81, Fenchurch Street, London, E.C., merchant in incandescent gas-mantles and accessories.

The Lighting of Llanfyllin.—What would be the price of gas? is the question that arises on reading a report of a public meeting of ratepayers of Llanfyllin, convened by the Town Council, to consider an offer by a local contractor to light the streets by electricity "at a price equivalent to 2d. less in the rates on the cost of gas of the last two years, and to provide current to private consumers at 5d. per unit, against 8½d. per 100 feet of gas, the above being equivalent quantities." The Chairman of the Gas Company said they had never paid a higher dividend than 3 per cent. Last year they only paid 1 per cent.; and the increased price now charged did not recoup them for the increased cost of coal. The meeting referred the matter back to the Town Council, and promised support in any action that would give the town cheaper lighting.

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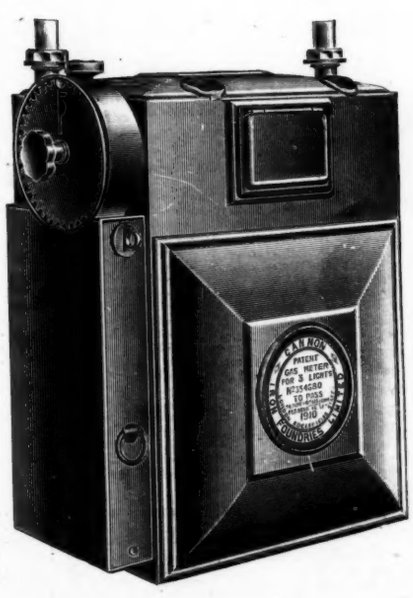

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Lighting Regulations in London.—A new lighting order has been issued by the Home Office for the Metropolitan Police District and the City of London. Under this the regulations as to shielding windows, reduction of lights, &c., are to apply from 10 p.m., until half-an-hour before sunrise. The order supersedes that dated Feb. 2; but the only changes are the variation in time.

South African Lighting Association, Limited.—The twenty-seventh ordinary general meeting of this Company will be held to-morrow (Wednesday), when the Directors will report that the business at both stations has diminished, but not seriously; and under the circumstances ruling during the year they "consider the results satisfactory." Substantial economies in the management expenses have been effected; and these, coupled with the increased charge for gas at Port Elizabeth (referred to in the last report), have raised the profit by £1136 over the amount shown in 1914. The sum available for distribution would permit of an increase in the dividend; but having regard to the uncertainty prevailing as to the general trend of trade in South Africa, the Directors propose, as in 1914, a dividend for the year of 8 per cent., less income-tax. In October last 3 per cent. only was paid as an interim dividend; so that a final distribution of 5 per cent. is now recommended. This will amount to £4500, and leave to be carried forward to the next year a sum of £3415, compared with £2404.

Work on the Keighley Reservoir.—At last Tuesday's meeting of the Keighley Town Council, the Mayor (Mr. W. A. Brigg), in submitting for confirmation the minutes of the Water Committee, said the Minister of Munitions wrote a short time ago asking if it would be possible to stop work on the reservoir in course of construction in the Sladen valley, because of the urgent need of quarrymen and labourers for the erection of buildings for munition making. The Committee would have been really very glad to close-down the works altogether—for financial reasons alone; but they felt that this might involve some very troublesome problems. The puddle-trench was about two-thirds filled-up with cement; and the Committee were advised that to allow this cement to set-hard for six months or a year and then put other cement on top would probably result in imperfect cohesion. They would thus have to face the possibility of leakage, which would be extremely expensive to remedy if discovered after the trench had been filled-in. The Engineer and himself had been to London, and had a consultation with a representative of the Ministry of Munitions on the subject; and they had received permission to proceed with the work, on condition that they reduced the number of men to the lowest possible. This was a £200,000 undertaking; and to have the whole thing put in jeopardy seemed to the Committee a much greater responsibility than they could fairly be asked to take.

STOCK MARKET REPORT.

On the Stock Exchange last week markets underwent a change; and a check was administered to the rather free tendency to make a quick advance which had been displayed the week before. This was attributed to political utterances, which, while not casting a shadow of doubt on the ultimate victory of our arms, warned the public not to be in too great a hurry, or to imagine they could descry peace looming a little way ahead. These admonishments enjoining moderation on those who are inclined to get a little out of hand are always salutary. And so prices last week in most of the leading markets and some others showed a wholesome shrinkage. In the gilt-edged group, Home Government issues opened very firm, but after a day or two began to recede. Colonials continued almost unchanged. In Home Rails, sellers were more ready to accommodate, and buyers less ready to accept. Grave questions affecting domestic affairs weighed upon Americans; and Canadians were lower in spite of fine traffics. The Foreign Market was less buoyant; but French and Brazilian were fairly given. Argentines were inclined to irregularity; but South Africans showed strength throughout. In the Miscellaneous Market, rubber was dull on the whole; but oil was pretty steady, and shipping concerns were in continued demand. Business in the Gas Market was only very moderate, and once more the lion's share of it was engrossed by the three largest undertakings. Prices everywhere showed a pleasing accession of strength—the advances being 1 point in Gas Light ordinary, 10 points in Imperial Continental, 1½ in South Metropolitan, and 2½ in Tottenham "B." In the Money Market, rates hardened. Among general topics of interest, little is heard now about the next War Loan. The sale of Exchequer Bonds is going on briskly, and the promised issue of three-year and five-year Bonds should promote further demand. One point that "gives to reflect" is that Treasury Bills now total about £700,000,000! The closure of the Stock Exchange two Saturdays in the month this summer is being strongly advocated.

Bargains done for cash during the week were as follows: On Monday, British 35, 35⅛, Gas Light ordinary 74, 74⅛, 74⅜, ditto maximum 60, ditto debenture 60, South Metropolitan 80. On Tuesday, European 13, 13⅛, Gas Light ordinary 74⅛, 74⅜, ditto preference 74, 74⅛, Imperial Continental 76½, South Metropolitan 79½, 80, Tottenham "B" 92, 92½. On Wednesday, Bournemouth debenture 72, Gas Light ordinary 74⅛, 75, 75⅛, Imperial Continental 79½, 80, 80½, Primitiva (1911) 62, 62¾, South Metropolitan 79⅛, 79⅜, 79½, 79⅝, 80, 80⅛, 80½. On Thursday, Bournemouth debenture 73, European 12⅞, Gas Light ordinary 75, 75⅛, ditto preference 74⅛, ditto debenture 59, Imperial Continental 79, 79⅛, 79½, 79⅝, 80, 80⅛, ditto debenture 65⅛, 66⅛, 66⅜, South Metropolitan 79½. On Friday, Imperial Continental 79, South Metropolitan 79⅝. On Saturday, Gas Light ordinary 75, 75⅜, ditto preference 75, 75⅜, Imperial Continental 79⅛, 79½, 79⅜, 80, 80⅛.

Reports state that it has been decided by the Town Council of Copenhagen that fewer lamps are to be lighted in the streets. In future, gas and electric power will not be supplied by the municipal works for illuminated advertising signs.

PRE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.		
1,551,868	Stk.	April 8	2½	5½	Alliance & Dublin Ord.	59—64	8 18 2	..
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 8	..
280,000	5	April 29	7½	8/-	Bombay, Ltd.	5½—6⅝	5 17 8	..
60,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	29—30	5 6 8	..
338,110	10	,,	7	7/-	B 7 p.c.	15—15½	4 10 4	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	4 5 9	..
159,740	—	—	—	4	4 p.c. Deb.	.. —		72—73
992,045	Stk.	Feb. 26	†14	£6/-	Brentford A Consold.	261—266	5 5 8	..
784,920	,,	,,	†11	55/-	Do. B New	204—209	5 5 8	..
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
221,400	,,	June 11	4	4	Do. 4 p.c. Deb.	91—98	4 6 0	..
217,880	Stk.	Feb. 26	11	10⅜	Brighton & Hove Orig.	208—213	5 3 4	..
244,200	,,	,,	8	7⅜	Do. A Ord. Stk.	154—159	5 0 8	..
630,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	35—35⅛
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	..
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,518,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	..
560,000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 8 11	..
800 000	Stk.	,,	4	4	Continental Union, Ltd.	76—79	5 1 3	..
200 000	,,	,,	7	7	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,400	—	—	—	11½	Croydon B and C 7 p.c.	.. —		..
492,270	Stk.	—	6	5½	Derby Con. Stk.	128—125	4 16 0	..
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd.	17½—18	5 11 1	12½—13½
16,827,185	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord.	98—102	4 15 6	74—75½
2,600,000	,,	,,	3½	3½	3½ p.c. max.	76—79	4 8 7	60
4,062,235	,,	,,	4	4	4 p.c. Con. Pref.	96—99	4 0 10	74—75⅝
4,674,850	,,	June 11	3	3	3 p.c. Con. Deb.	72½—74½	4 0 6	59—60
130,000	,,	,,	10	10	10 p.c. Bonds	.. —		..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16⅝	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c.	.. —		..
131,000	Stk.	Mar. 12	7½	7½	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅜	5⅞	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental	150—160	5 12 6	76½—80½
1,235,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	65½—66½
235,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
2,498,905	Stk.	Feb. 26	10	5	Liverpool 5 p.c. Ord. { A	211—213	4 13 11	..
					{ B	146—148	4 14 7	..
306,088	,,	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	.. —		..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	6 13 4	..
1,575,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8/8	North Middlesex 7 p.c.	14—15	5 2 8	..
300,000	Stk.	May 14	8	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	6 9 0	..
60,000	50	Feb. 26	15	65/-	Portsea, Island B	128—131	4 19 3	..
100,000	50	,,	12	60/-	Do. C	118—121	4 19 2	..
52,000	50	,,	10	—	Do. D	.. —		..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	6 18 4	..
499,960	5	June 26	5	2/6	,, 5 p.c. Pref.	4⅝—5	5 0 0	..
521,600	100	June 2	4	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	4	,, ,, ,, 1911	.. —		62—62⅞
846,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5	5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	233—234	4 9 8	..
209,284	,,	,,	10	10	Do. B	232—234	4 9 8	..
625,500	,,	,,	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African	10½—11½	7 16 6	..
6,609,296	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	79½—80½
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	..
224,830	Stk.	Feb. 26	8½	8	South Shields Con. Stk.	157—159	5 6 11	..
962,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 5	..
60,000	,,	,,	5	5	Do. 5 p.c. Pref.	110—112	4 9 3	..
135,000	—	—	—	48/4	Do. West Kent.	.. —		..
187,558	,,	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
647,740	Stk.	May 14	5	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7½	7½	Tottenham District { A 5 p.c.	135—138	5 8 8	..
782,376	,,	,,	6	6	B 5½ p.c.	115—117	5 9 7	92—92½
181,355	,,	June 26	4	4	C 4 p.c. Deb.	87—89	4 9 11	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	93—95	5 5 8	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	103½—109½	4 11 4	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅝	78/9	Wandsworth A 5 p.c.	151—156	5 7 4	..
265,636	,,	,,	6⅞	63/9	,, B 3½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	56/11½	,, C 3½ p.c.	110—115	5 2 0	..
352,000	,,	,,	6⅞	57/6	Wimbledon 5 p.c.	117—122	5 0 5	..
98,000	,,	,,	6⅝	63/9	Epsom 5 p.c.	121—126	5 5 2	..
86,416	,,	June 26	3	3	5 p.c. Deb. Stk.	86—89	4 6 11	..

† Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

Gas a Necessary Commodity.

The legal case arising out of the inquiry which the Necessary Commodities Control Commission have been conducting in Sydney, was recently before the High Court. In the course of the inquiry the Australian Gaslight Company and the North Shore Gas Company were called upon to show cause why the present price of gas should not be reduced. The former Company took the case to the Courts; claiming that such an investigation was outside the jurisdiction of the Commission, as gas was not a necessary commodity within the meaning of the Necessary Commodities Control Act, and that the price of gas had already been fixed by Act of Parliament. They asked for an injunction to restrain the Commission from proceeding with the inquiry into the price of gas; but this the Chief Judge in Equity declined to grant, inasmuch as gas was a necessary commodity within the meaning of the Act. The Company thereupon took the matter to the High Court; and, by a unanimous decision, the appeal has been dismissed with costs. The Chief Justice (Sir Samuel Griffith) said he had come to the conclusion that the circumstances existing when the Necessary Commodities Control Act was passed, the local distribution of population in the State, and the temporary character of the law, were sufficient to show that Parliament did not intend to exempt the scheduled companies from its general provisions, even though they should have the effect of reducing the dividends permitted by the special provisions of the Gas Act.

Yeadon Water Bill.—At a special meeting of the Yeadon Urban District Council yesterday week, Mr. Longwood gave a long report on the opposition which had been made by the Council to the Yeadon Water Bill [*ante*, p. 401]. He said that while greatly disappointed that the Council failed to obtain the inclusion of a purchase clause, they had secured concessions in the matter of the charges for baths and other things which would be beneficial to the people of Yeadon. The report was accepted.

Tees Valley Water Board.—At a meeting of the Tees Valley Water Board, held recently at Middlesbrough, the statement for the half year ended Feb. 14 was presented. This showed the capital cost of the undertaking to date to be £2,899,024. The revenue account revealed an income of £62,570, and an expenditure of £13,832. The balance carried to the net revenue account was £48,738, as compared with £49,065 in the previous half year, and £52,024 in the corresponding six months.

Daylight Saving and Gas Prices.—In a letter to the "Yorkshire Post," Mr. W. H. Wood, of Leeds, says: After a week's knowledge of summer time, experience teaches us another improvement required to consolidate it. I want to urge all gas authorities to encourage gas cooking and heating, by reducing to one-half the cost of gas during summer time. Patriotism demands it, as the bye-products of gas-making are urgently wanted. Economy commends it, as otherwise the retorts will be thrown out of use and require renewing, and labour will be temporarily thrown out of gear. Business principles require it, as, when customers are accustomed to using gas for cooking and heating in "summer time," the habit will continue when the price of gas returns to its normal in winter. But, more than everything else, the health of the people living in cities will be improved by the absence of smoke and all the labour waste and dirt from household fires.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 24.]

Nos. 6889—7238.

ALLDAY, P. W., and ALLDAYS AND ONIONS PNEUMATIC ENGINEERING COMPANY.—"Gas annealing furnaces." No. 7117.
BALL, F. L.—"Combined tar dehydration and ammonia distillation plant." No. 6974.
BOND, A. J.—"Gas-fire burner or nozzle." No. 7199.
BRANDES, L.—"Lighting systems and lamp-posts." No. 7115.
CRACKNELL, T.—"Safety-valve for rubber connections for gas-stoves." No. 6918.
CRAWFORD, C.—"Burners for high-pressure gas-irons." No. 6915.
DREYFUS, S.—"Purification of trinitrotoluol." No. 7203.
DRYBURGH, A. P.—"Pipe-joints." No. 7050.
FLORENCE, A. P.—"Gas-cookers." No. 7070.
FLORENCE, A. P.—"Grilling and toasting apparatus." No. 7071.
FORWOOD, G. F.—"Distilling, cracking, and carbonizing." No. 6925.
HARRY, R. H.—See Crawford. No. 6915.
HILLER, H. K.—See Ball. No. 6974.
KEITH, G. & J.—"Delivering a mixture of gas and air or oxygen for combustion." No. 6898.
MAGGIORA, D.—"Gas-generators." No. 7072.
PORTHAM, R. S.—See Dryburgh. No. 7050.
POTTERTON, T.—"Gas-heated boiler." No. 6947.
ROBERTS, A.—"Coke-ovens, and treatment of gases therefrom." No. 7034.
ROGERS, F. H.—"Manufacture of trinitrophenol." No. 7068.
ROSTIN, H.—See Forwood. No. 6925.
SIX, G.—See Rogers. No. 7068.
SOC. E. BARBET ET FILS ET CIE.—"Extracting benzols from heavy oils." No. 7051.
WHITTLE, R. W.—See Dryburgh. No. 7050.

The work of laying two 6-inch steel tubes across the bed of the River Ouse at Selby, for the purposes of supplying water by Selby to the Barlby parish, was completed last week. The cost of the whole scheme will be £4000; and of the portion affecting the river bed £1000. The pipes are of a new steel type which has enabled the contractors to overcome difficulties previously experienced.

The death is announced of the wife of Mr. J. Firth Blakeley, the Managing-Director of Messrs. Firth Blakeley, Sons, and Co., Limited, of Dewsbury and Church Fenton. She had an apoplectic seizure, brought on, it is thought, by the sudden heat last Saturday week, losing consciousness very early on the Sunday, from which she never rallied, and passed away about 2 a.m. the following morning.

At a local auction sale, last Thursday week, 500 cumulative additional ordinary 7 per cent. shares in the Frimley and Farnborough District Water Company were sold at prices of from £13 5s. to £12 12s. 6d. per share; the average price realized being £12 19s. 3d. per share. It was explained that the capital is required by the Company largely to meet the requirements of the military authorities, who are taking a great deal of water.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

FEMALE RENTAL CLERKS AND METER INSPECTORS. No. 6182.
GAS MANAGER. Ripon Corporation. Applications by June 10.
TINSMITHS. W. Edgar, Hammersmith.

Appointments, &c, Wanted.

COLLECTORSHIP. No. 6183.

Plant, &c. (Second Hand), Wanted.

PURIFIERS. No. 6179.
TANK-WAGGONS. No. 6181.

Plant, &c. (Second Hand), For Sale.

CAST-IRON TANK. Steavenson and Co., Wandsworth.
WEIGHING MACHINE. Aldridge and Ranken, Bath.

Meeting.

INSTITUTION OF GAS ENGINEERS, at the Institution of Civil Engineers. June 6. 10.30 a.m.

TENDERS FOR

Coal.

BATLEY CORPORATION. Tenders by June 13.
EAST RETFORD GAS DEPARTMENT. Tenders by June 8.
FOLKESTONE GAS COMPANY. Tenders by June 9.
GLASGOW GAS DEPARTMENT. Tenders by June 9.
GUILDFORD GAS COMPANY. Tenders by June 2.
TODMORDEN GAS DEPARTMENT. Tenders by June 5.
WIGAN GAS DEPARTMENT. Tenders by June 15.

Lime.

LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 6.

Tar and Liquor.

EAST RETFORD GAS DEPARTMENT. Tenders by June 8.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 6.
MACCLESFIELD GAS DEPARTMENT.
NORTHWICH GAS COMPANY. Tenders by June 10.
SUTTON-IN-ASHFIELD GAS DEPARTMENT. Tenders by June 5.

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See Illustrated Advertisement, May 16, p. 361.

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Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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INVERTED BURNERS and CONVERSION SETS for Street Lamps.

HUMPHREY (UPRIGHT TYPE) GAS-LAMPS.

WE Notice there are still a considerable number of our ORIGINAL GAS ARC LAMPS in use throughout the Country, and desire to make known that we are now booking instructions for renewal parts and accessories, also GLASSWARE for each type of lamp, for forward delivery. Sole Representatives for Humphrey Gas Goods, THE GENERAL GAS LIGHT CO., 58 64, Leonard Street, LONDON, E.C.

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & Co., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

LEEDS UNIVERSITY.
(DEPARTMENT OF COAL GAS AND FUEL INDUSTRIES).

CORBET WOODALL SCHOLARSHIP IN GAS ENGINEERING.

THE above-named Scholarship, of the value of £50 a Year, and Tenable at the University for a period of Three Years, with power of Extension for a Fourth Year, is offered for Competition by Candidates desiring to enter the University in October, 1916.
Candidates are required to submit their Applications, not later than the 22nd of June, to the SECRETARY, The University, LEEDS, from whom full Particulars as to the Conditions of Award may be obtained.

LEEDS UNIVERSITY.
(DEPARTMENT OF COAL GAS AND FUEL INDUSTRIES).

RESEARCH FELLOWSHIP.

APPLICATIONS are invited, up to June 22, for an OPEN FELLOWSHIP of £100 per Annum, established by the Institution of Gas Engineers for the prosecution of Post-Graduate Research in Gas Chemistry.
For further Particulars, Apply to the SECRETARY, The University, LEEDS.

WANTED—Collectorship to a Gas Company. London or North Kent preferred. Over Military Age. Experienced.
Address No. 6183, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

CITY OF RIPON.

GAS MANAGER WANTED.

THE Corporation invite Applications for the Post of GAS MANAGER at a commencing Salary of £200 per Annum, with House, Coals, Gas, &c., free.
No person eligible for Military Service need apply, and Canvassing, directly or indirectly, of Members of the Council will disqualify.
Applicants must have a knowledge of both Horizontal and Vertical Retorts and the Manufacture of Sulphate of Ammonia.
For further Particulars, apply to the undersigned.
Applications, with not more than three recent Testimonials, must be sent in to me not later than Saturday, the 10th of June next.

By order,
M. KIRKLEY,
Town Clerk.

Town Hall, Ripon,
May 26, 1916.

WANTED, immediately, for Period of War, Two Female RENTAL CLERKS and Two Female METER INSPECTORS (Auto and Ordinary) for a Gas Company in North Devon.
Apply, by letter, stating Salary required, to No. 6182, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

TINSMITHS required. No one on Government work need apply.
WM. EDGAR, Blenheim Works, Lower Mall, HAMMERSMITH.

PURIFIERS Wanted.—Sets 12 ft. and 18 ft. square PURIFIERS wanted, with 12-inch or 14-inch Connections.
State Age, Makers, and Price to No. 6179, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTING to Hire—Two Rectangu- lar TANK-WAGGONS for Three to Six Months.
Send full Particulars and Price, to No. 6181, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WEIGHING Machine for Sale—One New Mild Steel WEIGHING HOPPER, with four Openings at Bottom fitted with Sliding Doors suitable for Coal or Other Minerals. Size, 9 ft. by 9 ft. by 4 ft. 9 in. deep. Capacity, trimmed, 240 cubic feet. Fitted with Avery's Weighing Levers and Steelyard graduated up to 5 tons.
Apply, ALDRIDGE AND RANKEN, Avonbank Works, BATH.

EXCELLENT Cast-Iron Tank. 14 ft. by 14 ft. by 5 ft. ⅜-inch Metal, about 8 Tons. £60 on Vans London.
STEAVENSON AND Co., Osier Iron-Works, Point Pleasant, WANDSWORTH, S.W.

BOROUGH OF EAST RETFORD.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply of 9000 Tons of Screened GAS COAL or NUTS, to be Delivered at the Sidings of the Great Northern or Great Central Railway Company during the Year ending June 30, 1917.
Forms of Tender may be had, with any further Particulars, from the undersigned.
Sealed Tenders, endorsed "Tender for Coal," are to be addressed to the Chairman of the Gas Committee on or before June 3, 1916.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
Grove Street, Retford.

BOROUGH OF EAST RETFORD.

THE Gas Committee of the above Corporation are open to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their works during the Year ending June 30, 1917.
Tenders to be sent in addressed to the Chairman of the Gas Committee, endorsed "Tender for Liquor," on or before June 3, 1916.

J. B. FENWICK,
Engineer and Manager.

Gas and Water Office,
Grove Street, Retford.

LOUGHBOROUGH CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Lough- borough Corporation invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months from the 1st of July, 1916, to the 30th of June, 1917.
Estimated amount of Tar, 550 Tons; Liquor, 1200 Tons.
The Contractor to state Price for Liquor at 5° Twaddel, and per Ton extra for every ½° above 5°.
The Corporation to Deliver both Tar and Liquor either into Contractor's Boats at Canal Wharf, or into Contractor's Tanks at the Midland, Great Central, or London and North Western Stations, Loughborough.
Tenders to be endorsed "Tenders for Tar and Liquor," and addressed and Delivered to H. Perkins, Esq., Town Clerk, Loughborough, not later than Tuesday, the 6th of June next.
The Committee do not bind themselves to accept the highest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

Loughborough, May 23, 1916.

TENDERS FOR LIME.

THE Gas Committee of the Lough- borough Corporation invite TENDERS for their Requirements of Best Hand-Picked LIME for Purifying purposes, to be Delivered at Loughborough Station as required from the 1st of July, 1916.
Tenders, to be endorsed "Tenders for Lime," and addressed and Delivered to H. Perkins, Esq., Town Clerk, Loughborough, not later than Tuesday, June 6 next.
The Committee do not bind themselves to accept the lowest or any Tender.

EDWARD ONIONS,
Engineer and Manager.

Gas-Works, Loughborough,
May 23, 1916.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.
(GAS COMMITTEE.)

TENDERS FOR TAR.

THE Gas Committee of the above Council invite TENDERS for the Surplus TAR produced at their Works between July 1, 1916, and June 30, 1917, to be Delivered in Purchaser's Tanks at the Council's Sidings at the Great-Northern Railway Station.
No Tender Forms provided.
The Committee do not bind themselves to accept the highest or any Tender.
Tenders, endorsed "Tar," to be addressed as under so as to arrive not later than Monday, June 5, 1916.

By order,
JOHN D. FIDLER,
Clerk.

Sutton-in-Ashfield, May 18, 1916.